



A Report Prepared For:

California Regional Water Quality Control Board  
San Francisco Bay Region  
1515 Clay Street, Suite 1400  
Oakland, California 94612

Attention: Mr. Alec W. Naugle, P.G.

**SUMMARY OF REMEDIAL INVESTIGATIONS,  
FEASIBILITY STUDY AND REMEDIAL ACTION PLAN  
NAPA PIPE FACILITY  
1025 KAISER ROAD  
NAPA, CALIFORNIA**

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**VOLUME 5  
OTHER AREAS – FABRICATION BUILDINGS AREA, DOUBLE-ENDER  
BUILDING, INTERNAL COATING BUILDING, AND FORMER ACID  
DRAIN LINE**

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## 1.0 INTRODUCTION

This Volume 5 of this Summary of Remedial Investigations, Feasibility Study and Remedial Action Plan (RI/FS/RAP) has been prepared by PES Environmental, Inc. (PES) on behalf of Napa Redevelopment Partners, LLC (NRP) to address soil and/or groundwater affected primarily by petroleum hydrocarbons and metals at the Other Areas Sites (the Site). The Site comprises a portion of the Napa Pipe Facility, located at 1025 Kaiser Road in Napa, California (hereafter, the Facility). The location of the Facility and Site are shown on Plates 1 and 2, respectively. The Facility is divided into seven environmental sites (refer to Plate 2): Site 1, Site 2/3, Site 4, Site 5, Site 6, Site 7 and Other Areas. As noted on Plate 2, Volumes 2, 3, and 4 of this RI/FS/RAP address cleanup of soil and groundwater at Site 2/3, Site 4, and Site 6, respectively. Volume 1 provides an overview of the RI/FS/RAP for the Facility, including an executive summary.

As discussed in Volume 1, soil and groundwater investigations at Site 5, Site 7, and portions of Site 2/3 (the former Pipe Storage Areas) have indicated that these areas are absent of substantial environmental impacts. Accordingly, active remedial action measures are not anticipated for those portions of the Facility at this time. Nor are those portions of the Facility subject to on-going regulatory oversight. Site 7 is hydrogeologically upgradient of the other six sites and was previously chosen as a “background” site (James M. Montgomery, Consulting Engineers, Inc. [JMM], 1990a). Site 1 is permitted and maintained as a Class II Waste Management Unit (WMU).

As shown on Plate 2, the Other Areas Site includes the Fabrication Buildings Area, former Double-Ender Building, former Internal Coating Building, and former Acid Drain Line. However, the southeastern portion of the Fabrication Buildings Area is not included in this document because it became apparent after conducting field investigations in September through November 2006 that commingling groundwater plumes exist between this area and the former Drum Storage Area (Site 6). Therefore, the southeastern portion of the Fabrication Buildings Area is included in the Site 6 RI/FS/RAP (i.e., Volume 4).

The Facility contains both former and current steel pipe fabricating buildings. The tenant (TransBay Steel) that leases the Fabrication Buildings and adjoining buildings, which are located in the northwestern portion of Facility (Plate 2), is currently conducting steel fabrication. The previous Facility owner (i.e., Napa Pipe Corporation, a wholly-owned subsidiary of Oregon Steel Mills, Inc.) removed equipment and materials from the remaining buildings after the purchase of the Facility by NRP.

### **1.1 Regulatory Context and Cleanup Level Selection**

This document has been prepared in accordance with: (1) discussions between NRP representatives and staff of the California Regional Water Quality Control Board – San Francisco Bay Region (RWQCB), and (2) the existing RWQCB orders for the Facility, Order No. 90-147 and Order No. R2-2205-0012. The RWQCB’s Environmental Screening Levels



(ESLs) (RWQCB, 2005) have been used as screening tools (with modifications discussed below) and are proposed in this RI/FS/RAP as cleanup levels for the Site/Facility. The ESLs are intended to provide conservative screening values such that the presence of chemicals in soil, soil gas, or groundwater at concentrations below the corresponding ESL can be assumed not to pose a significant, long-term (chronic) threat to human health and the environment.

ESLs were developed by the RWQCB to address environmental protection goals presented in the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan). These goals include:

Surface Water and Groundwater:

- Protection of drinking water resources;
- Protection of aquatic habitats;
- Protection against vapor intrusion into buildings; and
- Protection against nuisance conditions.

Soil:

- Protection of human health (direct-exposure);
- Protection against vapor intrusion into buildings;
- Protection against leaching and subsequent impacts to groundwater;
- Protection of terrestrial biota; and
- Protection against nuisance conditions.

Through the use of standard risk assessment assumptions and methodology, the RWQCB's ESLs are protective of each of the above factors. Because the soil and groundwater data for the Sites were compared to the conservative and protective ESLs, and because cleanup to those levels is proposed in this RAP, a site-specific risk assessment is not included in this RI/FS/RAP<sup>1</sup>.

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<sup>1</sup> See the RWQCB's ESL website (<http://www.swrcb.ca.gov/rwqcb2/esl.htm>) for complete discussion of the ESL development process. As noted in the ESL document, additive risk due to the potential presence of multiple chemicals with similar target health effects are addressed through the use of conservative exposure assumptions and target risk levels. Also, while the ESLs do not specifically address potential synergistic effects, as noted in the ESL document, "Synergistic effects are primarily of concern for exposure to multiple chemicals at concentrations significantly higher than those expressed in the direct-exposure ESLs. Conservative target risk goals (e.g., target excess cancer risk of  $10^{-6}$ ) and exposure parameters used to develop screening levels further reduce this concern." Note also that the bulk of the soil and groundwater contamination is from relatively low toxicity petroleum hydrocarbons with only a few carcinogenic compounds present.

The final ESLs defined in the RWQCB's ESL document were adjusted to account for these factors: (1) shallow groundwater at the Facility is not a current or potential source of drinking water<sup>2</sup>; and (2) groundwater gradients are relatively flat, and groundwater plumes are stable and do not show migration; consequently, there is no pathway for discharge of groundwater plumes to the aquatic resources of the Napa River. Because of these factors, ESLs protective of drinking water and aquatic habitats do not apply and the next lowest default ESLs were used<sup>3</sup>. A summary of the ESLs used for the Facility is provided in Table 1. Note that some of the constituents listed on the table were not detected at the Other Areas Sites. The table is intended to be comprehensive and inclusive of all of the constituents detected in soil and groundwater at Sites 2/3, 4, 6, and the Other Areas Sites. As discussed in Section 6.0, only a few chemicals at the Other Areas Sites are chemicals of concern that require soil and groundwater remediation. The final cleanup levels for these chemicals are listed in Section 6.1.6 and are the same as the ESLs for these chemicals.

In applying ESLs, since residential land use is anticipated for the Fabrication Buildings Area, the former Internal Coating Building, and the former Acid Drain Line, soils data from these Other Areas sites are compared to the residential ESLs (see Table 1). Since commercial land use is anticipated<sup>4</sup> for the former Double-Ender Building, soil data from this area are compared to commercial ESLs (see Table 1). Shallow soil samples (collected from less than 3 meters, about 10 feet) are compared to the Shallow Soil ESLs. Deep soil samples (greater than 3 meters) are compared to the Deep Soil ESLs.

As indicated on Table 1, two Shallow Soil residential and commercial ESLs exist for the total petroleum hydrocarbons (TPH) middle distillates parameter. For the shallowest soils (0 to 3 feet below ground surface [bgs]<sup>5</sup>) the lower of the two values is selected to conservatively address nuisance odor issues. Similarly, two Shallow Soil residential ESLs exist for the TPH residual fuels parameter; for shallowest soil the lower of the two values is selected to conservatively address nuisance odor issues.

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<sup>2</sup> The average Facility-wide electrical conductivity (EC) of water samples collected from wells screened within the shallow and deep aquifers (see Section 2.3 for definitions of these aquifers) is 5,114 microSiemens/cm ( $\mu\text{S}/\text{cm}$ ). By the State Water Resources Control Board Resolution 88-63 definition of sources of drinking water (i.e., water with EC less than 5,000  $\mu\text{S}/\text{cm}$ ), the two shallowest groundwater aquifers at the Facility are not considered sources of drinking water. As such, the non-drinking water ESLs are applicable to the Facility.

<sup>3</sup> The specific pathway is the protection of surface water resources via soil leaching to groundwater and discharge of groundwater to surface water.

<sup>4</sup> Land use in this area is restricted to commercial/industrial uses only, due to Napa County Airport fly-over prohibitions against residential construction.

<sup>5</sup> To be conservative, samples collected from 3 to 3.5 feet bgs are considered "shallowest soil" in this report because the laboratory may have analyzed soil from the very top of the soil liner, which would be more representative of 3 feet bgs rather than 3.5 feet bgs.

## **1.2 Objectives of RI/FS/RAP**

The objectives of the RI/FS/RAP are to: (1) identify remediation strategies that will meet the Remedial Action Objectives (prevent adverse impact to human health and avoid further degradation of groundwater quality); and (2) present a program for remediation of soil and groundwater affected by either petroleum hydrocarbons or metals at the Sites. The RI/FS/RAP:

- Summarizes previous environmental investigations conducted at the Sites;
- Presents the results of the supplemental remedial investigation conducted by PES in September through March 2007;
- Summarizes the chemicals of concern, specifies the chemicals to be remediated and associated cleanup levels for the Sites, and defines the extent of soil and groundwater media that will require remediation;
- Identifies and evaluates applicable remedial technologies and alternatives;
- Recommends a preferred remedial alternative; and
- Outlines the tasks to implement the recommended remedial action.

## **1.3 Organization**

The RI/FS/RAP includes the following sections:

**Section 1.0 – Introduction.** The introduction presents a general explanation of the objectives and organization of the RI/FS/RAP.

**Section 2.0 – Site Background.** This section provides a description of the Site, summarizes current and historical uses of the Site, discusses the geology and hydrogeology of the Site, and summarizes previous environmental investigations conducted at the Site.

**Section 3.0 – Supplemental Remedial Investigation.** This section presents the methodologies and results of the supplemental remedial investigation recently conducted at the Site by PES.

**Section 4.0 – Nature and Extent of Contamination.** This section discusses the nature and extent of soil and groundwater contamination at the Site and presents conceptual site models (CSM).

**Section 5.0 – Contaminant Fate and Transport.** This section discusses contaminant fate and transport including a discussion of potential routes of migration, degradation mechanisms, and transport mechanisms.

**Section 6.0 – Chemicals of Concern and Remediation Extent.** This section summarizes the chemicals of concern identified at the Site, specifies the chemicals to be remediated and associated cleanup levels and defines the extent of soil and groundwater media that will require remediation.

**Section 7.0 – Feasibility Study Scoping.** This section defines the scope of the feasibility study, the applicable and relevant and appropriate requirements, the remedial action objectives, and specifies the proposed cleanup levels.

**Section 8.0 – Identification and Screening of Remedial Technologies.** This section identifies and screens potentially applicable technologies for remediating soil and groundwater to meet the remedial action objectives.

**Section 9.0 – Development of Remedial Alternatives.** This section assembles technologies into remedial alternatives, describes them, and presents costs to implement the alternative.

**Section 10.0 – Evaluation of Remedial Alternatives.** This section evaluates each alternative **individually** and comparatively, in terms of the remedial action objectives and regulatory evaluation criteria. A preferred remedial alternative is identified.

**Section 11.0 – Remedial Action Plan Implementation.** This section presents the procedures for implementation of the preferred remedial alternative for the Sites and presents a schedule for remedial action implementation and reporting.

## **2.0 SITE BACKGROUND**

A physical description of the Site and discussion of current and historical uses of the Site are presented below.

### **2.1 Site Description**

As shown on Plate 2, the Other Areas Site include the Fabrication Buildings Area, former Double-Ender Building, former Internal Coating Building, and former Acid Drain Line. A description of the Site is presented below.

The Fabrication Buildings Area is located in the northwestern corner of the Facility, and is bounded to the east by the railroad right-of-way that bisects the Facility and to the west by the Napa River (see Plates 2 and 3). As shown on Plate 3, a seawall is present along the portion of the Napa River directly west of Fabrication Bays 1 and 2. The Fabrication Buildings Area consists of the western portions of Fabrication Bays 1 and 2, a building on the northeast side of Fabrication Bay 1 (i.e., former pickling tank area on Plate 3), the Pre-Fab Bay, the Mold Loft, and various other small buildings and structures around these buildings (see Plates 2 and 3). These buildings occupy a combined area of approximately 234,000 square feet. TransBay

Steel is currently leasing Fabrication Bays 1 and 2, the Pre-Fab Bay, and the Mold Loft. Areas within these buildings house large machinery used for the tenant's operations. The locations of pits associated with this machinery are shown on Plate 3. TransBay Steel also stores equipment and materials both inside and outside these buildings. For the most part, the floors of these buildings are concrete. The areas surrounding these buildings are mostly asphalt paved. Currently, the floor of the mold loft is covered with steel plates. Former pickling pits are also suspected to exist in this area. Structures, site features, and above and below ground utilities present in and around the Fabrication Buildings Area are shown on Plate 3. The main subsurface utilities lines in the vicinity of the Fabrication Buildings Area are the sanitary and storm drain systems (see Plate 3).

The former Double-Ender Building lies in the southern portion of the property, just east of the railroad right-of-way (see Plate 2 and 4) and occupies an area of approximately 30,250 square feet. All machinery and features associated with its former pipe manufacturing use have been removed. Building Materials West (North Pacific) currently leases the building and the surrounding area to store lumber products. The floor of this building is asphalt paved. The asphalt was placed in 2006 to prepare the building for its new warehousing use.

The former Internal Coating Building lies approximately 200 feet northeast of the former Double-Ender Building (see Plates 2 and 4). This building lies within the boundaries of Site 4, but was not investigated during the previous investigations conducted at Site 4. Therefore, investigation of the building was included in the PES's workplan, titled *Supplemental Remedial Investigation Workplan, Other Areas* (PES, 2006a). Details of the workplan are provided in Section 3.0. The former Internal Coating Building, which occupies about 38,750 square feet, is currently unoccupied and devoid of machinery related to its former pipe manufacturing use. Features and structures within this concrete-floored building include a former paint storage area, a mezzanine area, and various grate-covered shallow (approximately 1 to 1.5 feet deep), concrete-lined pits associated with the former operations in this building.

The former Acid Drain Line investigation area is located just north of the Facility's water treatment plant (see Plates 2 and 4). Currently, the southern and western portions of the former Acid Drain Line investigation area are used for parking, and the northern and eastern portions are leased by a tenant, Cultured Stone, and used for decorative stone storage.

## **2.2 Other Areas Site History**

### **2.2.1 Fabrication Buildings Area Site History**

The Basalt Rock Company (Basalt), who constructed steel ships and barges during World War II, first used the former Fabrication Bays to support these efforts. At the end of World War II, Basalt had a well-equipped facility that included four drydocks, machine shops, and plate shops (Montgomery Watson Harza [MWH], 2005). Beginning in the late 1940s, the fabrication equipment was used for the construction of heavy plate components, including pressure vessels, bridge girders, and offshore platform components (Montgomery Watson

[MW], 1996). In 1955 Kaiser Steel purchased the Facility and began expanding operations at the Facility in order to produce large diameter steel pipe. Kaiser Steel went bankrupt in 1986, and Napa Pipe purchased the property in 1987. Napa Pipe resumed the previous Facility use of fabricating large steel pipes.

Historically, the Fabrication Buildings Area has been used for cutting, welding, bending, rolling, and general fabrication of steel products (MWH, 2005). TransBay Steel has leased the Fabrication Buildings Area since 1997. They currently produce steel components for bridges and highways. The 1965 (Kaiser Steel) site plan of the Fabrication Buildings Area included in Appendix A suggests that “pickling tanks” previously existed in the area where a building is currently located on the northeast side of Fabrication Bay 1 (also see Plate 3 for location of this building). This site plan was obtained from a geotechnical report prepared by Woodward-Clyde-Sherard and Associates for the proposed addition of Fabrication Bay 2 (Woodward-Clyde-Sherard and Associates, 1965).

According to Mr. Jim Swindle (personal communication, 2006) who has worked at the Facility since the mid-1960s, a diesel underground storage tank (UST) once existed on the east side of the Pre-Fab Bay, but he did not have any knowledge of its current status or exact location. Also, evidence of a second possible UST feature was found on the southwest side of the Pre-Fab Bay where a metal plate labeled “Tank Below” exists (see Plate 3). Both of these areas were investigated and are discussed further in Sections 3.0 and 4.0.

The U.S. Army Corps of Engineers constructed the seawall along the Napa River during the 1940s as an improvement for the Basalt Rock Company facility (MW, 1996). MW indicated that the seawall was constructed east of the course of the Napa River. At the completion of construction, the area between the Napa River and the new seawall was dredged to bring the river water up against the wall. The total depth of the seawall is not known, but it is believed that the wall extends at least to the soft river bottom, which is at a depth of 16 feet bgs (MW, 1996). MW performed geophysical testing of the wall in the mid-1990s that suggested the wall extends to a depth of approximately 20 feet bgs (MW, 1996). The testing also suggested that the wall may be built on top of pilings or caissons that extend at least to the total depth tested (37 feet bgs). The approximate location of the seawall is shown on Plate 3.

### **2.2.2 Former Double-Ender Building Site History**

Based on a review of various base maps and aerial photographs, the former Double-Ender Building was constructed sometime between 1965 and 1975. This building was historically used to end-weld two lengths of 40-foot long sections of pipe into one 80-foot long pipe (MWH, 2005). Forty-foot pipe sections were placed along the northern end of the building where they were aligned and conveyed along the assembly line. A series of actuators were located in the shaker table area (see Plate 4) and were used to trigger elevator levers that moved the pipe down the line. The actuators were initially pneumatically driven, but as pipe diameters increased through time, the actuators were upgraded around 1982 to a hydraulically driven system (MW, 1999).

Operations in the former Double-Ender Building were typically performed by on-site vendors/subcontractors (MWH, 2005). During a majority of Napa Pipe Corporation's operation, Midwestern Pipeline Services Company operated this building. Excavation activities took place in 1998 to remove hydraulic oil staining underneath six hydraulic actuators (the excavation activities are discussed in detail in Section 2.4).

### **2.2.3 Former Internal Coating Building Site History**

Similar to the former Double-Ender Building, a review of various base maps and aerial photographs indicates that the former Internal Coating Building was also constructed sometime between 1965 and 1975. This building was historically used to apply various epoxy coatings to the inside of steel pipes. During a majority of Napa Pipe Corporation's operation, Midwestern Pipeline Services Company operated this building (MWH, 2005). A small paint storage building was located within the building (see Plate 4).

### **2.2.4 Former Acid Drain Line Site History**

The installation date of the former Acid Drain Line is not known. As indicated on utility drawings provided by Napa Pipe Corporation, and reproduced on Plate 4, the line (a 12-inch vitrified clay pipe [v.c.p.]) was abandoned in 1961 after the Pipe Mill stopped pickling activities in 1960/1961. Waste fluids from the suspected former pickling tanks at the Fabrication Buildings Area were also likely transported along this line. At some unknown time after its closure, much of the line was dug up.

## **2.3 Geology and Hydrogeology**

The following sections discuss the Facility-wide hydrostratigraphy, and hydrogeology specific to the Other Areas sites.

### **2.3.1 Facility-Wide Hydrostratigraphy**

Hydrostratigraphic units present at the Napa Pipe Facility include, from youngest (structurally shallowest) to oldest (structurally deepest), fill, younger alluvium, older alluvium, and the bedrock volcanics (MW, 1996). These units are described below.

#### **2.3.1.1 Fill**

According to MW, fill materials placed in many low-lying areas along the Napa River floodplain have ranged from dredging spoils to imported engineered fill (MW, 1996).

### 2.3.1.2 Younger Alluvium

Younger alluvium is characterized as a thin veneer of unconsolidated clay, silt, sand, and gravel that locally may yield water to wells if a sufficient thickness of the unit is saturated (Kunkel and Upson, 1960).

### 2.3.1.3 Older Alluvium

The older alluvium overlies the bedrock volcanics and is characterized by poorly sorted mixtures of clays, silts, sands, and gravels. At this Facility, a hardpan (cemented) horizon is commonly found in the uppermost part of this unit. Regionally, the older alluvium yields good quality water and is considered a source of potable groundwater (Kunkel and Upson, 1960).

### 2.3.1.4 Bedrock Volcanics

Tuff, breccia, and agglomerate, with locally interbedded volcanic flows characterize the bedrock volcanics. Depth to bedrock beneath the Facility is greater than approximately 380 feet bgs. Aquifers within tuff and breccia zones are usually confined and typically yield good quality water; wells completed in these zones are used for domestic, agricultural, and industrial water supply (Kunkel and Upson, 1960).

## **2.3.2 Site-Specific Hydrogeology**

Site-specific geologic and hydrogeologic information was compiled based on data obtained during PES's investigations conducted in September through March 2007 (discussed in Section 3.0). Lithologic logs for PES's investigations are included in Appendix B. Plates 5 and 6 are geologic cross sections A-A' and B-B' for the Fabrication Buildings Area; the locations of these cross sections are shown on Plate 3. Geologic cross sections were not created for the remaining Other Areas sites because limited subsurface data is available. However, the geology at the remaining sites is discussed below and is based on the lithologic logs included in Appendix B.

Appendix C includes lithologic logs for lithologic logs B-1, B-2, and B-3 completed by J.H. Kleinfelder & Associates (J.H. Kleinfelder & Associates, 1983) and lithologic logs Hole 1, Hole 2, and Hole 3 completed by Woodward-Clyde-Sherard and Associates (Woodward-Clyde-Sherard and Associates, 1965) during geotechnical investigations associated with the proposed addition of Fabrication Bay 2 and modification of the Pre-Fab Bay, respectively. Lithologic logs Hole 3, B-1, B-2, and B-3 were used on cross section A-A' (Plate 5). The approximate locations of the lithologic logs used cross section A-A' are shown on Plate 3.

Previous investigations at the Facility have identified three hydrostratigraphic units (MW, 1996). From uppermost (youngest) to lowermost (oldest), these units are:

- Fill Unit;



- Silt/Clay Unit (Younger Alluvium); and
- Partially Cemented Silt/Sand Unit (Older Alluvium).

The following sections discuss the hydrogeology at each of the Other Areas sites. The discussion for the Fabrication Buildings Area is more in depth than the remaining Other Areas sites because numerous borings were completed in this area during the supplemental remedial investigation and, as indicated above, a geotechnical investigation was conducted at the Pre-Fab Bay prior its modification in the mid-1980s.

#### 2.3.2.1 Fabrication Buildings Area Hydrogeology

##### **Fill Unit**

A heterogeneous fill is the uppermost unit encountered in the Fabrications Building Area. As shown on the cross sections, the thickness of the fill varies across this area, but is generally 4 to 7 feet thick. The fill unit in the Fabrications Buildings Area can generally be characterized as heterogeneous mixture of predominantly sand and gravel with various proportions of silt and clay. Typically, the fill is varying shades of gray and brown, dry to wet, loose to dense; debris such as pieces of concrete, asphalt, brick, and metal were not found in this unit. The fill unit is generally non-water-bearing in the uppermost 4 feet. However, in areas where the fill unit extends to depths below 4 feet bgs it can be saturated across large intervals.

As shown on cross section B-B' (see Plate 6), separate-phase product was encountered in the fill unit and underlying partially cemented silt/sand unit (i.e., older alluvium on cross section B-B') in the vicinity of the suspected former UST location. The presence of separate-phase product in borings completed at the Fabrication Buildings Area is discussed in more detail in Section 4.1.2.

##### **Silt/Clay Unit**

The silt/clay unit, which correlates with the younger alluvium, is located stratigraphically below the fill unit and is underlain by the partially cemented silt/sand unit. In general, the silt/clay unit is present in the western portion of the Fabrication Buildings Area near the Napa River and in the vicinity of Fabrication Bays 1 and 2, but is not present in the vicinity of the Pre-Fab Bay and the area to the east and immediately west of this building. As shown on cross section A-A' (see Plate 5), the silt/clay unit is not present beneath a majority of the Pre-Fab Building and, as shown on cross section B-B' (see Plate 6), this unit pinches out to the east.

In the Fabrication Buildings Area, the silt/clay unit is heterogeneous and consists of: (1) silts and clays that are mottled blue/greenish gray to black (organic rich), moist to wet, and soft to medium stiff. The unit contains plant fragments, rootlets, and wet fibrous peat stringers of varying thicknesses. Also, clayey to silty sand lenses are present in this unit, especially in borings completed closer to the Napa River. MW interpreted the silty clay unit as floodplain

and tidal marsh deposits and the interbedded sand stringers as likely representing deposits by small stream channels that drained the area (MW, 1993).

### **Partially Cemented Silt/Sand Unit**

The partially cemented silt/sand unit, which correlates with the older alluvium, is located stratigraphically below the silty clay unit or directly below the fill unit as discussed above. In the Fabrication Buildings Area, this unit typically consists of dark yellowish brown to olive brown, moist to wet, weakly to moderately cemented silty sand with varying amounts of gravel. Interbedded layers of silts, sandy silts, and clayey sand are also present. The abundance of sands and gravels compared to fines indicates that a high energy environment existed in the vicinity of the Fabrication Buildings Area during the deposition of this unit. As shown on Plate 1, a northeast to southwest trending tributary of the Napa River is present just north of the Facility. The partially cemented silt/sand unit may represent older alluvial materials associated with this tributary that were deposited (e.g., possible sand bar deposits) in the vicinity of the Fabrication Buildings Area.

As shown on the cross sections A-A' and B-B' (see Plate 5 and 6, respectively), the depth to the top of the partially cemented silt/sand unit (i.e., older alluvium on cross sections) varies from approximately 4 to 10 feet bgs. The depth to this unit is greatest when it underlies the silt/clay unit (i.e., younger alluvium on cross sections).

#### **2.3.2.2 Former Double-Ender Building Hydrogeology**

Lithologic units encountered in the vicinity of the former Double-Ender Building include the fill unit, the silt/clay unit, and the partially cemented silt/sand unit. The fill unit in the vicinity of this building extends to depths varying between approximately 3.25 to 6 feet bgs. The fill unit in this area can be characterized as heterogeneous, varying shades of brown and olive, dry to moist, loose to dense, generally non-water bearing, and is classified as a silty sand with varying amounts of gravel. Debris was not observed within this unit.

The silt/clay unit is located stratigraphically below the fill unit throughout the building and is generally characterized as greenish gray to black (organic rich), moist, soft to stiff, and contains varying amounts of sand and gravel. Plant material is present in this unit, but was only found in borings DE9 and DE10 located in the northern portion of the building. In the southern portion of the building, the top of the silt/clay unit is found at depths varying between 3.25 to 6 feet bgs. In the northern portion of the building, the top of this unit is found at approximately 4.5 feet bgs.

The partially cemented silt/sand unit is located stratigraphically below the silt/clay unit throughout the building. This unit mostly consists of a medium stiff to stiff, moist to wet, weakly cemented silt with occasional interbeds of clay and sandy silts. The depth to the top of this unit varies from approximately 6 feet bgs near borings DE4 and DE6 to 10 feet bgs at boring DE10.

### 2.3.2.3 Former Internal Coating Building Hydrogeology

Lithologic units encountered in the vicinity of the former Internal Coating Building during the supplemental remedial investigation included the fill unit and silt/clay unit. The thickness of the fill varies across the building, ranging from about 3 to 9 feet thick. The fill unit in most of the borings was approximately 5 to 5.5 feet thick. The thickest intervals of fill were encountered in borings IC2 and IC4 where the unit was 8.5 to 9 feet thick (see Plate 4 for boring locations). The fill unit in the vicinity of this building can be characterized as heterogeneous, grey and olive, dry to wet, loose to dense, and is generally classified as a silty sand with gravel to a sandy silt. Debris was not observed within this unit. In places, a silty clay to sandy clay was encountered beneath the concrete floor of the building. This unit generally became wet at about 4 to 5 feet bgs.

The silt/clay unit is found below the fill unit throughout the building, and is generally dark greenish gray to black (organic rich) in color, moist, and soft to stiff. The unit contains varying amounts of plant material that generally increase in concentration with depth. Also, a peat layer was encountered at 11 feet bgs in boring IC5. The only coarser layer found interbedded in this unit was a 3-inch thick wet sandy gravel layer at 5.75 feet bgs in boring IC3.

The partially cemented silt/sand unit was not encountered in the borings completed within this building, which were drilled to a maximum depth of 12 feet bgs. The partially cemented silt/sand unit was found at a depth of approximately 20 feet bgs in deep wells DW-2 and DW-6, which are located near the Maintenance Garage to the northwest (see discussion of this unit in the Volume 3 RI/FS/RAP).

### 2.3.2.4 Former Acid Drain Line Area Hydrogeology

Lithologic units encountered in the vicinity of the former Acid Drain included the fill unit and silt/clay unit. The fill unit in borings ADL1 through ADL3 varies from approximately 8 to 9 feet thick. This unit is heterogeneous, generally brown, black and yellow in color, dry to wet, and is classified as a silty clay with sand to gravelly sand with silt. Debris was not observed within this unit. Wet soil was encountered between 4 to 6 feet bgs in this unit.

The silt/clay unit is located below the fill unit through the former Acid Drain Line investigation area. This unit is homogeneous, black (organic rich) to dark greenish gray in color, wet, soft to medium stiff, and contains plant fragments.

## **2.3.3 Groundwater Occurrence and Flow Directions**

The occurrence of groundwater beneath the Other Areas sites can generally be divided into two groundwater zones:

- The Shallow Groundwater Zone – Encompasses water-bearing soils within the fill and silt/clay units, and the partially cemented silt/sand unit where this unit lies directly below the fill unit (i.e., where the silt/clay unit is absent). Based on water-level data (i.e., static conditions) obtained during the supplemental remedial investigation, this zone begins at: (1) approximately 4.8 to 6.7 feet bgs at the Fabrication Buildings Area; (2) approximately 5.7 to 6.5 feet bgs at the former Double-Ender Building; (3) approximately 4 to 5.6 feet bgs at the former Internal Coating Building; and (4) approximately 4.3 feet bgs in the former Acid Drain Line investigation area; and
- The Deep Groundwater Zone – Encompasses water-bearing soils within the partially cemented silt/sand unit. The depth to the top of this zone is not known at the Other Areas Sites because data related to this zone was not collected during the supplemental remedial investigation.

Groundwater data at the Other Areas sites is limited because there are not groundwater monitoring wells at these sites. However, general groundwater flow directions in the vicinity of the Other Areas sites can be estimated using: (1) Facility-wide groundwater potentiometric surface maps; and (2) the general direction of movement of groundwater contamination. Facility-wide water level measurement events are conducted on a semiannual basis as part of the Facility-wide groundwater monitoring program. Shallow Groundwater Zone potentiometric surface maps for the two most recent events conducted on May 16, 2006 (PES, 2006b) and October 3, 2006 (PES, 2007) are provided on Plates 7 and 8, respectively. A brief discussion of groundwater occurrence and flow direction at each of the Other Areas sites is presented below. The Deep Groundwater Zone is not discussed below because no data related to this zone was collected during the supplemental remedial investigation discussed in Section 3.0.

#### 2.3.3.1 Groundwater Occurrence and Flow Directions (Fabrication Buildings Area)

As shown on Plates 7 and 8, the groundwater flow direction in the southwestern most portion of the Fabrication Buildings Area is likely south to southeast, similar to that at the former Machine Shop at Site 6. As discussed in the *Site 6 Characterization and Remedial Action Plan* (MW, 1996) and the Site 6 RI/FS/RAP (i.e., Volume 4), the seawall, which is present on the west sides of Fabrication Bays 1 and 2, appears to have a major influence on groundwater conditions and flow. Based on the absence of tidal influence in shallow wells located adjacent to the seawall (see discussion in Volume 4), MW concluded that the seawall “acts as a nearly impermeable barrier to water flow, effectively prohibiting groundwater flow between the Shallow Groundwater Zone and the Napa River.”

In the more northerly portions of the Fabrication Buildings Area, groundwater flow in the Shallow Groundwater Zone is expected to be more westerly toward the Napa River. As discussed in Section 4.0 (Nature and Extent of Contamination), a petroleum hydrocarbon plume of limited extent that is present in the central portion of the Pre-Fab Bay displays a

general direction of migration toward the west (although the plume is generally confined to the building footprint).

#### 2.3.3.2 Groundwater Occurrence and Flow Direction (Former Double-Ender Building)

Based on flow directions in the portion of Site 4 east of the railroad tracks, groundwater flow in the vicinity of the former Double-Ender Building is expected to be southwest to west toward the Napa River (see Plates 7 and 8).

#### 2.3.3.3 Groundwater Occurrence and Flow Direction (Former Internal Coating Building)

As shown on Plates 7 and 8, a number of Site 4 monitoring wells are near the former Internal Coating Building; groundwater flow in the vicinity is known and is generally west to southwest toward the Napa River. In the May 16, 2006 event, groundwater flow was to the southwest (see Plate 7) and in October 3, 2006 event groundwater flow was to the west (see Plate 8).

#### 2.3.3.4 Groundwater Occurrence and Flow Direction (Former Acid Drain Line)

As shown on Plates 7 and 8, groundwater flow direction in the vicinity of the former Acid Drain Line investigation area appears to be to the west toward the Napa River.

### 2.4 Previous Investigations

The only environmental investigation or remedial action conducted at the Other Areas Sites involved excavating hydraulic oil-impacted soil within the former Double-Ender Building. The results of the hydraulic oil-impacted soil removal are summarized below and presented in the *Technical Memorandum, Summary of Soil Removal Action and Infrastructure Upgrade at the Double-Ender Facility* (MW, 1999). The confirmation soil sample results from this soil removal are also incorporated into Sections 4.0 (Nature and Extent of Contamination) and 6.0 (Chemicals of Concern and Remediation Extent).

In July of 1998 MW supervised the removal of soils beneath six small hydraulic actuators where hydraulic oil staining was observed on the surface soil. This work was completed as part of a shutdown and maintenance program in July 1998. Engineering/Remediation Resources Group Inc. (ERRGI) was contracted as the earthwork and construction contractor. ERRGI used a backhoe and hand digging to excavate the soil from the actuator pits. Hand digging was necessary because of below-grade utilities, structural I-beams, and related infrastructure surrounding the actuator pits. The complicated below-grade infrastructure also limited the extent of soil removal that was possible during this event. The excavations were typically terminated between 5 and 6 feet bgs. Excavated soil mainly consisted of densely compacted sandy gravel fill material. The fill material was generally underlain by a firm silty clay unit that MW believed represented the top of the native soil. The silty clay was considered by MW to be a low permeability layer due to a low hydraulic conductivity.

The six actuator pits were labeled A through F (see plates in Appendix D and Plate 4 for actuator pit locations). A MW geologist collected eleven discrete soil samples from the sidewalls or floors of the actuator pits in order to confirm the contaminated soil had been removed. Each confirmation soil sample was analyzed for TPH as hydraulic oil (TPH-ho); sample F-1 was also analyzed for metals (see plates in Appendix D for sample locations). The highest concentration of TPH-ho was detected in sample B-1 at 42,000 milligrams per kilogram (mg/kg). According to MW, sample B-1 was collected directly beneath a hydraulic oil line, and therefore MW considered this data point to be “anomalous.” Additional soil was removed by hand from the area where this sample was collected, but a second confirmation sample was not collected to confirm whether the contaminated soil had been removed because the initial results were considered to be “anomalous.”

The remaining soil samples had concentrations of hydraulic oil ranging from 15 mg/kg to 22,000 mg/kg. Two (samples D-1 at 4,700 mg/kg and E-1 at 22,000 mg/kg) of the remaining 10 confirmation soil sample results exceeded the ESL value of 2,500 mg/kg (i.e., Shallow Soil [ $<3$  meters], commercial ESL for TPH residual fuels). A number of metals were detected in sample F-1, but only arsenic at 6 mg/kg exceeded its respective commercial ESL value of 5.5 mg/kg (see tables in Appendix D for a summary of the analytical results).

Aggregate base rock was placed in the base of each actuator pit and compacted to 95% following excavation and confirmation sampling activities. Concrete pedestal and curbing were then constructed in each of the actuator pits. The concrete base of the pedestal and curbing provided protection to underlying soils from future minor hydraulic leaks. Excavated soils were stockpiled and placed in container bins, and eventually disposed of at B&J Landfill in Dixon, California.

MW concluded that the local small “pockets” of TPH-ho-impacted soil posed negligible threat to human health because the area was covered with either machinery, AC paving, or compacted base rock.” However, MW indicated that further evaluation and remediation of impacted soils may be necessary if the Double-Enders Building is decommissioned. As discussed in Section 2.0, all machinery and features associated with the building’s former use has been removed and the building floor has been completely repaved with asphalt.

### **3.0 SUPPLEMENTAL REMEDIAL INVESTIGATION**

The following sections present the field activities and methods (Section 3.1) and analytical results (Section 3.2) for the supplemental remedial investigation conducted by PES in September 2006 through March 2007.

#### **3.1 Field Activities and Methods**

Prior to conducting the supplemental remedial investigation, PES reviewed historical Facility documents and prepared a workplan that was submitted to RWQCB staff for review. The

RWQCB approved the work plan in September 2006. The workplan, titled *Supplemental Remedial Investigation Workplan, Other Areas* (PES, 2006a), recommended that subsurface investigations be conducted to assess soil and groundwater conditions in the vicinity of the: (1) Fabrication Buildings Area; (2) former Double-Ender Building; (3) former Internal Coating Building; and (4) former Acid Drain Line. A summary of the work completed at each of the Other Areas Sites is presented below.

### **Fabrication Buildings Area**

The following work was completed at the Fabrication Buildings Area between September 2006 and March 2007:

- Thirty-eight (38) borings were advanced in September 2006 during the initial phase of work at the Fabrication Buildings Area (borings TB4 through TB17, TB22, TB23, and TB26 through TB47) to assess soil and groundwater conditions. Boring TB44 was drilled adjacent to the metal plate labeled “Tank Below”;
- Borings TB53 and TB54 were advanced in early November 2006 to delineate the extent of petroleum hydrocarbons in soil and groundwater contamination in the vicinity of boring TB22 located on the south side of Fabrication Bay 2;
- Advanced borings TB56 through TB60 on November 20, 2006 to assess the extent of elevated petroleum hydrocarbons in soil and groundwater found in the vicinity of the central portion of the Pre-Fab Bay during the initial phase of work;
- Completed a geophysical survey in mid-February 2007 in the vicinity of boring TB57 to assess whether a UST was present;
- Following the geophysical survey, which identified an anomaly just east of boring TB57, borings TB61, TB65, and TB66 were advanced on east side of the Pre-Fab Bay in late February 2007 to further delineate the extent of petroleum hydrocarbons in soil and groundwater. Also, borings TB62, TB63, and TB64 were advanced in the suspected former pickling tank area on the northeast side of Fabrication Bay 1 to assess soil and groundwater conditions in this area; and
- In early March 2007 a backhoe was used to trench within the footprint of the anomaly identified during the geophysical survey to assess whether a UST was present in this area.

A summary of the samples collected from the borings advanced in the Fabrication Buildings Area, and the analyses performed on the samples is provided in Table 2.

### **Former Double-Ender Building**

The following work was completed at the former Double-Ender Building between September through November 2006:

- Advanced eight borings (DE1 through DE3, DE5, and DE7 through DE10) in the vicinity of the former Double-Ender Building during September 2006 to assess soil and groundwater conditions; borings DE4 and DE6 could not be completed because refusal was encountered at approximately 4 feet bgs (possible filled in concrete sumps or vaults). In addition, four near-surface soil samples (DESS1 through DESS4) were collected in the unpaved area located on the east side of the building where welding waste was observed; and
- Advanced borings DE4 and DE6 in early November 2006.

A summary of the samples collected from the borings and near-surface locations advanced in the former Double-Ender Building, and the analyses performed on the samples is provided in Table 2.

### **Former Internal Coating Building**

Seven borings (IC1 through IC7) were advanced within the former Internal Coating Building in September 2006. A summary of the samples collected from these borings and the analyses performed on the samples is provided in Table 2.

### **Former Acid Drain Line**

The following work was completed at the former Acid Drain Line between September through November 2006:

- Advanced borings ADL1, ADL2, and ADL3 in the vicinity of the former Acid Drain Line during September 2006; and
- Advanced borings ADL4, ADL5, and ADL6 in the early November 2006 to delineate the extent of petroleum hydrocarbons in groundwater.

A summary of the samples collected from the borings advanced in the vicinity of the former Acid Drain Line, and the analyses performed on the samples is provided in Table 2.

#### **3.1.1 Pre-Field Activities**

Drilling permits were obtained from the Napa County Department of Environmental Management prior to all phases of drilling. PES contacted Underground Service Alert more than 48 hours before beginning exterior drilling activities, and retained California Utility



Surveyors, a private utility locating company, to clear all boring locations for subsurface utilities. A site-specific Health and Safety Plan was prepared for all sampling activities.

### **3.1.2 Sampling Methods**

#### **3.1.2.1 Soil/Grab Groundwater Borings and Near-Surface Samples**

RSI Drilling (RSI) of Woodland, California, under subcontract to PES, utilized a direct-push drilling rig to advance the borings to the desired depth, which ranged between 10 and 16 feet bgs. Either a single- or dual-walled sampling system equipped with a clear acetate liner was used to collect continuous soil cores from the borings. Soil samples for volatile organic compound (VOC) analysis were collected with an Encore™ sampling device. The near-surface samples were also collected using a direct-push rig.

A PES geologist observed the borehole drilling and prepared a lithologic log of the borings using the Unified Soil Classification System (USCS). The soil cores were screened for VOCs using a photoionization detector (PID) and the results were recorded on the lithologic log. Lithologic logs are presented in Appendix B. A lithologic log was not created for borings ADL4, ADL5, and ADL6 because these locations were sampled for groundwater only. Therefore, soil cores for logging and sampling purposes were not collected.

To facilitate groundwater sampling, a 1-inch diameter schedule 40 polyvinyl chloride (PVC) well casing fitted with a 10- to 15-foot section of factory-slotted PVC well screen was lowered into each boring selected for groundwater sampling. Grab groundwater samples were collected from the PVC casing with a peristaltic pump. New tubing was used at each sampling location. The samples were collected in appropriate laboratory-provided sample containers.

Sample containers were labeled to indicate project location, job number, boring number, sample number, and time and date collected. The samples were immediately placed in a thermally insulated cooler containing ice. The samples were picked up daily by a courier who transported them under chain of custody protocol to Curtis & Tompkins, LTD (C&T) of Berkeley, California. C&T is certified by the State of California for the requested analyses.

Downhole drilling and sampling equipment was cleaned via pressure washing or using a non-phosphate detergent and double-rinsed with potable water prior to use. Borings were backfilled with cement grout. Drill cuttings, equipment rinsate, and purged groundwater were containerized and stored at the Napa Pipe Facility pending proper disposal.

### **3.1.3 Analytical Methods**

All soil and groundwater samples delivered to C&T were accompanied by a sampler's chain of custody. The following test methods were used to perform the analyses indicated in Table 2:

- VOCs by United States Environmental Protection Agency (USEPA) Test Method 8260B;
- Total extractable hydrocarbons (i.e., reported as diesel [C10-C24] and motor oil [C24-C36]) by USEPA Test Method 8015B; a silica gel cleanup was included with this analysis;
- California Administrative Manual (CAM) 17 metals (i.e., also referred to as California Code of Regulations [CCR] Title 22 metals) by USEPA Test Method 6010B or 7471A (for mercury);
- Hexavalent chromium by USEPA Test Method 7196A; and
- pH by USEPA Test Method 9040B.

## **3.2 Analytical Results**

Analytical results for soil matrix and groundwater samples are presented in Tables 3 through 23. Laboratory analytical reports and chain of custody forms for samples analyzed by C&T are presented in Appendix E. Plates 9 through 13 and Plates 14 through 16 provide a graphical presentation of petroleum hydrocarbons in soil and groundwater for the Fabrication Buildings Area and the remaining Other Areas Sites, respectively. The nature and extent of contamination shown on these soil and groundwater plates are discussed in Section 4.0.

The soil and groundwater results for the Fabrication Buildings Area, the former Internal Coating Building, and the former Acid Drain Line are compared to the residential ESLs, and the soil and groundwater results for the former Double-Ender Building are compared to commercial ESLs. The residential and commercial ESLs are presented on Table 1.

### **3.2.1 Fabrication Buildings Area Analytical Results**

#### **3.2.1.1 Soil Results (Fabrication Buildings Area)**

##### **Petroleum Hydrocarbons**

As shown in Table 3, TPH as diesel (TPH-d) was detected in 45 of 103 soil samples analyzed for this constituent. Detected concentrations of TPH-d ranged from 1.0 mg/kg (2.5 to 3 ft. bgs sample from boring TB30) to 1,300 mg/kg (6.5 to 7 ft. bgs sample from boring TB57).

Results for the following three samples are at concentrations above ESL values:

- Boring TB5 at 5.5 to 6 ft. bgs = 510 mg/kg;
- Boring TB22 at 2.5 to 3 ft. bgs = 430 mg/kg; and
- Boring TB57 at 6.5 to 7 ft. bgs = 1,300 mg/kg.

TPH as motor oil (TPH-mo) was detected in 35 of 103 soil samples analyzed for this constituent (Table 3). Detected concentrations of TPH-mo ranged from 5.0 mg/kg (2.5 to 3 ft. bgs sample from boring TB28) to 880 mg/kg (2.5 to 3 ft. bgs sample from boring TB22). Only the 880 mg/kg result from boring TB22 was above the ESL.

### **Volatile Organics**

Acetone, sec-butylbenzene, and n-butylbenzene were the only VOCs detected in soil in the Fabrication Buildings Area (Table 4). Acetone was detected in three soil samples at a maximum concentration of 33 micrograms per kilogram ( $\mu\text{g/kg}$ ). Sec-butylbenzene and n-butylbenzene were detected in the 8.5 to 9 ft. bgs sample from boring TB57 at 13 and 6.8  $\mu\text{g/kg}$ , respectively. None of the detected VOCs are above ESL values.

### **Metals**

Eighteen (18) different metals were detected in the soil samples collected during the supplemental remedial investigation (Table 5). However, as summarized below, only six of the metals (antimony, arsenic, chromium, cobalt, nickel, and thallium) were at concentrations above their respective ESLs:

- **Antimony:** Detected above the ESL (6.1 mg/kg) in boring TB17 (12 mg/kg in the 7 to 7.5 ft. bgs sample);
- **Arsenic:** Detected above the ESL (5.5  $\mu\text{g/kg}$ ) in boring TB8 (5.6 mg/kg in the 6.5 to 7 ft. bgs sample); boring TB17 (14 mg/kg in the 7 to 7.5 ft. bgs sample); boring TB29 (6.1 mg/kg in the 2.5 to 3 ft. bgs sample); boring TB31 (6.6 mg/kg in the 7 to 7.5 ft. bgs sample); boring TB37 (5.9 mg/kg in the 7 to 7.5 ft. bgs sample); boring TB38 (6.3 mg/kg in the 3 to 3.5 ft. bgs sample) and boring TB62 (6.5 mg/kg in the 9 to 9.5 ft. bgs sample);
- **Chromium:** Detected above the ESL (58 mg/kg) in boring TB8 (61 mg/kg in the 6.5 to 7 ft. bgs sample); boring TB12 (63 mg/kg and 61 mg/kg in the 2 to 2.5 ft. bgs and 7 to 7.5 ft. bgs samples, respectively); boring TB17 (61 mg/kg in the 7 to 7.5 ft. bgs sample); boring TB29 (68 mg/kg in the 2.5 to 3 ft. bgs sample); boring TB31 (110 mg/kg in the 7 to 7.5 ft. bgs sample); boring TB63 (61 mg/kg in the 6 to 6.5 ft. bgs sample); and boring TB64 (84 mg/kg and 98 mg/kg in the 2 to 2.5 ft. bgs and 6 to 6.5 ft. bgs samples, respectively);
- **Cobalt:** Detected above the ESL (10 mg/kg) in boring TB12 (33 mg/kg in the 7 to 7.5 ft. bgs sample); boring TB27 (12 mg/kg in the 5.5 to 6 ft. bgs sample); boring TB29 (15 mg/kg in the 2.5 to 3 bgs sample); boring TB30 (11 mg/kg and 14 mg/kg in the 2.5 to 3 ft. bgs and 7 to 7.5 ft. bgs samples, respectively); boring TB31 (13 mg/kg in the 7 to 7.5 ft. bgs sample); boring TB37 (12 mg/kg and 14 mg/kg in the 2.5 to 3 ft. bgs and 7 to 7.5 ft. bgs samples, respectively); boring TB38 (13 mg/kg in the 5 to

5.6 ft. bgs sample); boring TB39 (12 mg/kg and 11 mg/kg in the 2 to 2.5 ft. bgs and 7 to 7.5 ft. bgs samples, respectively); boring TB60 (12 mg/kg in the 6.5 to 7 ft. bgs sample); boring TB62 (22 mg/kg in the 6 to 6.5 ft. bgs sample); TB64 (27 mg/kg and 11 mg/kg in the 6 to 6.5 ft. bgs and 9 to 9.5 ft. bgs samples, respectively);

- **Nickel:** Detected above the ESL (150 mg/kg) in boring TB12 (170 mg/kg in the 7 to 7.5 ft. bgs sample); and
- **Thallium:** Detected above the ESL (1.0 mg/kg) in boring TB62 (1.5 mg/kg in the 6 to 6.5 ft. bgs and 9 to 9.5 ft. bgs samples); boring TB63 (1.6 mg/kg in the 6 to 6.5 ft. bgs sample); and TB64 (1.2 mg/kg and 1.8 mg/kg in the 2 to 2.5 ft. bgs and 6 to 6.5 ft. bgs samples, respectively).

## **pH**

Soil samples collected from the borings advanced in the suspected former pickling tank area were analyzed for pH (i.e., borings TB62, TB63, and TB64). The pH results for the samples collected from these borings ranged from 6.7 to 12.0; the elevated pH result of 12.0 was detected in the 3.5 to 4 ft. bgs sample collected from boring TB63 (Table 5). As indicated on the lithologic log in Appendix B, a 2.5 ft. thick concrete slab was present directly above this sample; this slab was cored prior to advancing the boring. Therefore, the elevated pH result can likely be attributed to concrete dust or chips incorporated in the sample as a result of the coring process. The next highest pH result was 8.4 in the 6 to 6.5 ft. bgs sample from this boring.

### **3.2.1.2 Groundwater Results (Fabrication Buildings Area)**

#### **Petroleum Hydrocarbons**

TPH-d was detected in 21 of 50 grab groundwater samples analyzed for this constituent (Table 6). Detected concentrations of TPH-d ranged from 50 microgram per liter ( $\mu\text{g/l}$ ) in boring TB36 to 130,000  $\mu\text{g/l}$  in boring TB57. Results from the following four grab groundwater samples were at concentrations greater than the ESL of 2,500  $\mu\text{g/l}$ :

- Boring TB12 = 58,000  $\mu\text{g/l}$ ;
- Boring TB57 = 130,000  $\mu\text{g/l}$ ;
- Boring TB59 = 55,000  $\mu\text{g/l}$ ; and
- Boring TB60 = 9,600  $\mu\text{g/l}$ .

TPH-mo was detected in 10 of 50 grab groundwater samples analyzed for this constituent (Table 6). Detected concentrations of TPH-mo ranged from 410  $\mu\text{g/l}$  (boring TB45) to

18,000 µg/l (boring TB12). Results from the following three grab groundwater samples were at concentrations greater than ESL of 2,500 µg/l:

- Boring TB12 = 18,000 µg/l;
- Boring TB57 = 7,200 µg/l; and
- Boring TB59 = 3,600 µg/l.

### **Volatile Organic Compounds**

Eleven (11) different VOCs were detected at low concentrations in the grab groundwater samples collected in the Fabrication Buildings Area during this investigation. None of the detected VOCs are above ESL values (Table 7).

### **Metals**

Metals detected in grab groundwater at the Fabrication Buildings Area included arsenic, barium, cobalt, chromium, copper, molybdenum, nickel, vanadium, zinc, and hexavalent chromium. None of the detected metals are above ESL values (Table 8).

### **pH**

Grab groundwater samples collected from the borings TB62, TB63, and TB64, which were advanced in the suspected former pickling tank area, were analyzed for pH. The pH results for these borings ranged from 6.5 to 6.9 (Table 8).

## **3.2.2 Former Double-Ender Building Analytical Results**

### **3.2.2.1 Soil Results (former Double-Ender Building)**

#### **Petroleum Hydrocarbons**

As shown in Table 9, TPH-d was detected in 9 of 20 soil samples analyzed for this constituent. Detected concentrations of TPH-d ranged from 1.2 mg/kg (7 to 7.5 ft. bgs sample from boring DE10) to 97 mg/kg (3 to 3.5 ft. bgs sample from boring DE6). None of the results are at concentrations above ESLs values.

TPH-mo was detected in 8 of 20 soil samples analyzed for this constituent (Table 9). Detected concentrations of TPH-mo ranged from 14 mg/kg (3 to 3.5 ft. bgs sample from boring DE1) to 1,400 mg/kg (3 to 3.5 ft. bgs sample from boring DE6). None of the results are at concentrations above ESLs values.

### **Volatile Organic Compounds**

Acetone, methylene chloride, and 2-butanone were the only VOCs detected in soil at the former Double-Ender Building (Table 10). The maximum concentration of each compound (54 µg/kg, 200 µg/kg, and 15 µg/kg for acetone, methylene chloride, and 2-butanone, respectively) was detected in the 3 to 3.5 ft. bgs sample from boring DE6. None of the detected VOCs are above ESL values.

### **Metals**

A number of metals were detected in the near-surface soil samples collected from the exterior of the former Double-Ender Building (see Table 11). As summarized below, arsenic, chromium, cobalt, and selenium were detected at concentrations above their respective ESLs:

- **Arsenic:** Detected above the ESL (5.5 mg/kg) in near-surface sample location DESS1 (120 mg/kg);
- **Chromium:** Detected above the ESL (58 mg/kg) in near-surface sample location DESS1 (67 mg/kg);
- **Cobalt:** Detected above the ESL (10 mg/kg) in boring DE1 (15 mg/kg in the 7 to 7.5 ft. bgs sample); boring DE9 (13 mg/kg in the 6.5 to 7 ft. bgs sample); near-surface sample location DESS1 (63 mg/kg); near-surface sample location DESS3 (19 mg/kg); and
- **Selenium:** Detected above the ESL (10 mg/kg) in near-surface sample location DESS1 (35 mg/kg).

#### **3.2.2.2 Groundwater Results (former Double-Ender Building)**

### **Petroleum Hydrocarbons**

TPH-d was detected in 5 of 10 grab groundwater samples analyzed for this constituent (Table 12). Detected concentrations of TPH-d ranged from 55 µg/l (boring DE9) to 1,100 µg/l (boring DE6). None of the TPH-d grab groundwater results are at concentrations greater than the ESL of 2,500 µg/l.

TPH-mo was detected in 2 of 10 grab groundwater samples collected at the former Double-Ender Building (Table 12). Detected concentrations of TPH-mo were 1,800 µg/l (boring DE4) and 11,000 µg/l (boring DE6); the concentration in boring DE6 is above the TPH-mo ESL of 2,500 µg/l.

## **Volatile Organic Compounds**

Six (6) different VOCs were detected at low concentrations in the grab groundwater samples collected at the former Double-Ender Building during this investigation. None of the detected VOCs are above ESL values (Table 13).

### **3.2.3 Former Internal Coating Building Analytical Results**

#### **3.2.3.1 Soil Results (former Internal Coating Building)**

## **Petroleum Hydrocarbons**

As shown on Table 14, TPH-d was detected in 5 of 13 soil samples analyzed for this constituent. Detected concentrations of TPH-d ranged from 1.2 mg/kg (5.5 to 6 ft. bgs sample from boring IC7) to 160 mg/kg (2.5 to 3 ft. bgs sample from boring IC4). The result for the sample collected from IC4 is above the TPH-d ESL of 100 mg/kg.

TPH-mo was detected in 4 of 13 soil samples collected at the former Internal Coating Building (Table 14). Detected concentrations of TPH-mo ranged from 15 mg/kg (3 to 3.5 ft. bgs sample from boring IC1) to 1,200 mg/kg (2.5 to 3 ft. bgs sample from boring IC4). The result for the sample collected from IC4 is above the TPH-mo ESL of 500 mg/kg.

## **Volatile Organic Compounds**

Acetone was the only VOC detected in the soil in the former Internal Coating Building (Table 15). The maximum concentration of acetone (22 µg/kg) was detected in the 6 to 6.5 ft. bgs sample from boring IC4. None of the acetone detections are above the ESL value.

## **Metals**

A number of metals were detected in the six soil samples analyzed at the former Internal Coating Building (Table 16). As summarized below, only arsenic and cobalt were detected at concentrations above their respective ESLs:

- **Arsenic:** Detected above the ESL (5.5 mg/kg) in boring IC2 (11 mg/kg in the 6.25 to 6.75 ft. bgs sample); and
- **Cobalt:** Detected above the ESL (10 mg/kg) in boring IC2 (12 mg/kg and 29 mg/kg in the 3 to 3.5 ft. bgs and 6.25 to 6.75 ft. bgs samples, respectively); boring IC4 (14 mg/kg in the 6 to 6.5 ft. bgs sample); and boring IC7 (12 mg/kg in the 5.5 to 6 ft. bgs sample).

### 3.2.3.2 Groundwater Results (former Internal Coating Building)

#### **Petroleum Hydrocarbons**

TPH-d was detected in 4 of 7 grab groundwater samples analyzed for this constituent (Table 17). Detected concentrations of TPH-d ranged from 58 µg/l (boring IC7) to 370 µg/l (boring IC3). None of the results are at concentrations greater than the TPH-d ESLs of 2,500 µg/l.

TPH-mo was detected in boring IC3 at 430 µg/l; this concentration is below the ESL of 2,500 µg/l. TPH-mo was not detected in the remaining six grab groundwater samples analyzed for this constituent (Table 17).

#### **Volatile Organic Compounds**

Six (6) different VOCs were detected at low concentrations in the grab groundwater samples collected at the former Internal Coating Building during this investigation. None of the detected VOCs are at concentrations above ESL values (Table 18).

### **3.2.4 Former Acid Drain Line Analytical Results**

#### 3.2.4.1 Soil Results (former Acid Drain Line)

#### **Petroleum Hydrocarbons**

As shown in Table 19, TPH-d was detected in 4 of 6 soil samples analyzed for this constituent. Detected concentrations of TPH-d ranged from 1.0 mg/kg (2.5 to 3 ft. bgs sample from boring ADL1) to 4.5 mg/kg (2.5 to 3 ft. bgs sample from boring ADL3). None of the results are at concentrations greater than ESLs.

TPH-mo was detected in boring at 9.3 mg/kg in the 2 to 2.5 ft. bgs sample from boring ADL2; this concentration is below the ESL of 500 mg/kg. TPH-mo was not detected in the remaining soil samples collected in the vicinity of the former Acid Drain Line (Table 19).

#### **Volatile Organic Compounds**

VOCs were not detected in the soil samples collected from borings ADL1, ADL2, and ADL3. Therefore, a VOC results table was not created for the former Acid Drain Line site. VOC results for the samples collected from these borings are presented laboratory analytical reports included in Appendix E.



## **Metals**

A number of metals were detected in the soil samples collected in the vicinity of the former Acid Drain Line (Table 20). However, the only metal detected at a concentration above ESLs is cobalt. As shown on Table 20, cobalt was detected in 5 of 6 soil samples at concentrations ranging from 11 mg/kg (2.5 to 3 ft. bgs sample from boring ADL1) to 21 mg/kg (2.5 to 3 ft. bgs sample from boring ADL3). All of the detected concentrations are above the ESL of 10 mg/kg.

### **3.2.4.2 Groundwater Results (former Acid Drain Line)**

## **Petroleum Hydrocarbons**

TPH-d was detected in 4 of 6 grab groundwater samples analyzed for this constituent (Table 21). Detected concentrations of TPH-d ranged from 81 µg/l (boring ADL2) to 230 µg/l (boring ADL3). None of the results are at concentrations greater than ESLs.

As shown on Table 21, TPH-mo was detected in 2 of 6 grab groundwater samples analyzed for this constituent. TPH-mo was detected at 970 µg/l in boring ADL4 and 1,300 µg/l in boring ADL3; these results do not exceed the ESL of 2,500 µg/l.

## **Volatile Organic Compounds**

The only VOC detected in the grab groundwater samples collected in the vicinity of the former Acid Drain Line during the supplemental remedial investigation was acetone in boring ADL3 (at 29 µg/l). The detected concentration is below the ESL value for acetone (Table 22).

## **Metals**

Six (6) metals were detected at low concentrations in the grab groundwater samples collected in the vicinity of the former Acid Drain Line. None of the detected metals are above ESL values (Table 23).

## **pH**

Grab groundwater samples collected from the borings advanced in the former Acid Drain Line investigation area were analyzed for pH. The pH results for these borings ranged from 6.0 to 6.5 (Table 23).

### **3.3 Geophysical Survey and Underground Storage Tank Verification Results**

A geophysical survey was conducted on February 22, 2007 to search for evidence of an UST on the east side of the Pre-Fab Bay where elevated concentrations of petroleum hydrocarbons were detected in soil and groundwater during the supplemental remedial investigation (see

analytical results discussion in Section 3.2). As discussed in Section 2.2.1, Mr. Jim Swindle indicated (personal communication, 2006) that a diesel UST once existed on the east side of the Pre-Fab Bay, but he did not have any knowledge of its current status.

PES' subcontractor Subtronic Corporation (Subtronic) of Concord, California performed the geophysical survey in the vicinity of boring TB57 east of the Pre-Fab Bay; the survey covered an area of approximately 80 by 100 feet. Equipment used by Subtronic's included: a hand held Schonstedt magnetic locator; a "Twin Box" conductivity pipe locator; and Ground Penetrating Radar (GPR). The Schonstedt magnetic locator and "Twin Box" conductivity pipe locator were unsuccessful in locating any anomalies in the survey area due to interference from the railroad tracks and metal possibly associated with old foundations. However, the GPR scan revealed an anomaly 3 to 4 feet bgs just east of boring TB57 (see Plate 3 for boring and suspected UST location). Subtronic outlined the anomalous area, which covered an area of approximately 6 by 14 feet, with markings on the ground surface. According to Subtronic's, the GPR survey data suggested that the anomaly might represent a UST that was still in place.

To assess whether a UST was in place at this location, PES contracted with John's Excavating of Santa Rosa, California, to excavate the anomalous area with a backhoe; the work was performed on March 6, 2007. A rectangular excavation (17 feet by 10 feet) was dug to a depth of 8.5 feet bgs in the anomalous area identified by Subtronic. A UST was not found, but there was evidence that the anomalous area had been excavated and backfilled in the past, suggesting that a UST may have been removed from this location. Lithologic logs for borings TB57 and TB61 (Appendix B), located immediately west and east of the anomalous area (see Plate 3), indicate that native soil material (i.e., silty gravelly sand; see cross section B-B' [Plate 6]) is present in the anomalous area beginning at a depth of about 5 to 5.5 feet bgs. In the area of the excavation, a sandy gravel (up to 3 inches in diameter) fill material was encountered from approximately 5.5 to 7 to 7.5 feet bgs; this material was loose, and contained separate-phase product hydrocarbon, a strong sheen, and a strong hydrocarbon odor. After exploring the northern, southern, and western edges of the anomaly it was apparent that the sandy gravel unit pinched out. The excavation was not extended eastward because an underground utility was present near the eastern edge of the anomaly. However, the sandy gravel fill material was not seen in boring TB61, located approximately 4 feet east of the anomaly. At the completed of exploratory activities, the excavation was backfilled and compacted.

#### **4.0 NATURE AND EXTENT OF CONTAMINATION**

The nature and extent of contamination in soil and groundwater at the Other Areas Sites is summarized below.

##### **4.1 Nature and Extent of Contamination at the Fabrication Buildings Area**

The following discussion of the nature and extent of contamination at the Fabrication Buildings Area has been divided into separate discussions for soil and groundwater. The soil distribution

maps presented on Plates 9 through 12, and the groundwater map presented on Plate 13, display the TPH data from the recently conducted supplemental remedial investigation. The nature and extent of VOCs in soil and groundwater is not discussed below because VOCs were not detected in this area at concentrations above ESLs. In addition, the nature and extent of metals in groundwater is not discussed because metals were not detected above groundwater ESLs in the vicinity of the Fabrication Buildings Area.

#### **4.1.1 Nature and Extent of Soil Contamination (Fabrication Buildings Area)**

##### **4.1.1.1 Petroleum Hydrocarbons in Soil**

The distribution of TPH-d in soil in the vicinity of the Fabrication Buildings Area is shown in the 1.5 to 4 ft. bgs interval on Plate 9, and in the 4 to 10 ft. bgs interval on Plate 10. In general, results posted for the shallow depth interval correlate with the fill unit and those posted for the deeper depth interval correlate with the silt/clay unit or the upper portion of the partially cemented silt/sand unit. As indicated in the explanation for each plate, the posted color dots represent various concentration ranges for TPH-d, relative to the ESL and orders of magnitude factors of the ESL.

As shown on Plates 9 and 10, areas where TPH-d was detected in soil at concentrations above ESL values include:

- In boring TB22 located on the south side of Fabrication Bay 2; and
- In borings TB5 and TB57 located on the east side of the Pre-Fab Bay.

The extent of TPH-d in soil at concentrations above ESLs is defined in both of these areas by surrounding borings, and by deeper samples within borings TB22 and TB57. The greatest extent of TPH-d at concentrations above the ESL is found in the 4 to 10 ft. bgs interval in the vicinity of boring TB57 on the east side of the Pre-Fab Building (Plate 10).

Based on the locations where elevated concentrations of TPH-d occur in soil at Fabrication Buildings Area, suspected sources include:

- **East Side of the Pre-Fab Building:** The source in this area is likely the suspected former UST location identified during the geophysical survey and the UST verification investigation discussed in Section 3.3; and
- **South Side Fabrication Bay 2:** The source in this area is not known.

The distribution of TPH-mo in soil at the Fabrication Buildings Area is shown on Plates 11 and 12 using the same depth intervals as previously described for the distribution of TPH-d. As shown on these plates, the only area where TPH-mo was detected in soil at concentrations above ESLs is in boring TB22 located on the south side of Fabrication Bay 2 (see Plate 11). As discussed above, the source of petroleum hydrocarbons in this area is not known.

Soil samples collected from boring TB44, which was completed immediately west (i.e., downgradient direction) of the metal plate labeled “Tank Below,” contained TPH-d and TPH-mo at maximum concentrations of 22 and 180 mg/kg, respectively (see Plates 9 through 12). These results suggest that the soil immediately downgradient of this area has not been significantly impacted by TPH.

#### 4.1.1.2 Metals in Soil

Soil samples in borings surrounding the Mold Loft (i.e., borings TB29, TB30, TB31, TB37, TB38, TB39, TB59, and TB60) and the former pickling tank area (i.e., borings TB62, TB63, and TB64) were analyzed for metals to assess whether suspecting pickling activities that may have previously taken place in this building released metals to soil and groundwater. Samples from the remaining borings analyzed for metals were selected in different areas throughout the Fabrication Buildings Area to assess whether releases occurred in other places within and around the building at this site.

Based on the metals results, it appears that the detected concentrations in the vicinity of the Fabrication Buildings Area represent background conditions. Further evidence supporting this conclusion is presented in Section 6.0.

#### 4.1.1.3 Soil pH

The soil pH results for borings advanced in the suspected former pickling tank area ranged from 6.7 to 8.4, with the exception of the elevated pH result of 12.0 that was detected in the 3.5 to 4 ft. bgs sample collected from boring TB63 (Table 5). As discussed in Section 3.2.1, the elevated pH in this sample was attributed to concrete dust or chips incorporated in the sample as a result of the coring process. The pH soil results suggest that the soils in this area are not acidic and, therefore, have not been impacted by the suspected pickling activities.

### **4.1.2 Nature and Extent of Groundwater Contamination (Fabrication Buildings Area)**

As indicated above, the nature and extent of VOCs and metals in groundwater is not discussed because they were either not detected or detected at concentrations below ESLs in the vicinity of the Fabrication Buildings Area.

The distribution of petroleum hydrocarbons in groundwater at the Fabrication Buildings Area is presented on Plate 13. As shown on this plate, TPH-d and TPH-mo at concentrations above ESLs is found in only one area at this site, which is located in the vicinity of the central portion of the Pre-Fab Bay. Based on the distribution of TPH-d and TPH-mo concentrations in groundwater, it appears that the source of TPH contamination is located on the east side of the Pre-Fab Bay where the maximum TPH-d concentration of 130,000 µg/l was detected. As indicated on Plate 13, TPH-d concentrations in the vicinity of this plume are significantly higher than the concentrations of TPH-mo, which suggests that the source of TPH in this area

is the suspected former diesel UST that is believed to have been located in the vicinity of boring TB57 (see discussion in Section 3.3). As shown on Plate 13, the extent of petroleum hydrocarbons in groundwater at concentrations above the ESL of 2,500 µg/l is well defined on the east and west sides of the plume, but is inferred in the vicinity of the Mold Loft and on the south and north sides of the plume. However, the extent of this plume could not further defined during the supplemental remedial investigation because: (1) this area is actively being used by the tenant; (2) materials are stored throughout this area by the tenant; (3) large machinery is present in this area; and (4) the floor of the mold loft is covered with thick steel plates, precluding drilling in this area. Prior to conducting remedial actions, additional characterization should be done to further define the extent of this plume.

The presence of a separate-phase product hydrocarbon in borings completed at the Fabrication Buildings Area is indicated on Plate 10 and cross sections A-A' and B-B' (Plates 5 and 6); petroleum hydrocarbon sheens or staining were not observed in the borings completed in the Fabrication Buildings Area. Based on the information obtained from the lithologic logs, separate-phase product was observed in the 4 to 10 feet bgs interval in borings TB57 and TB12, which are located on the downgradient side of the suspected former UST location. The likely source of separate-phase product at both borings is the suspected former UST location. As discussed in Section 3.3 and indicated on cross section B-B', separate-phase product was also observed in the suspected former UST tank location.

The groundwater sample collected from boring TB44, which was completed immediately west (i.e., downgradient direction) of the metal plate labeled "Tank Below," contained TPH-d and TPH-mo at concentrations of 290 and 1,700 µg/l, respectively, below the ESLs (see Plate 13). These results suggest that groundwater immediately downgradient of this area has not been significantly impacted by TPH.

The pH groundwater results for borings (i.e., TB62, TB63, and TB64) advanced in the suspected former pickling tank area, which ranged from 6.5 to 6.9 (see Table 8), suggest that groundwater in this area is only slightly acidic and, therefore, has not been impacted by the suspected pickling activities.

#### **4.2 Nature and Extent of Contamination at the Former Double-Ender Building**

The following discussion of the nature and extent of contamination at the former Double-Ender Building is divided into separate discussions for soil and groundwater. The soil distribution maps presented on Plates 14 and 15, and groundwater map presented on Plate 16, display TPH data from the recently conducted supplemental remedial investigation. The nature and extent of VOCs in soil and groundwater is not discussed because VOCs were not detected at concentrations above ESLs in the vicinity of the Double-Ender Building.

## **4.2.1 Nature and Extent of Soil Contamination (Former Double-Ender Building)**

### **4.2.1.1 Petroleum Hydrocarbons in Soil**

The distribution of TPH-mo in soil in the vicinity of the former Double-Ender Building is shown in the 1.75 to 4 ft. bgs interval on Plate 14, and in 4 to 7.5 ft. bgs interval on Plate 15. In general, results posted for the shallow depth interval correlate with the fill unit and those posted for the deeper depth interval correlate either with: (1) the lower portion of the fill unit; (2) the silt/clay unit; or (3) the upper portion of the partially cemented silt/sand unit. As indicated in the explanation for each plate, the posted color dots represent various concentration ranges for TPH-mo, relative to the ESL and orders of magnitude factors of the ESL.

As indicated on Plates 14 and 15, TPH-mo was not detected at concentrations above ESL values in the vicinity of former Double-Ender Building. Boring DE6 is the only location at this site with concentrations of TPH-mo in soil above 35 mg/kg. TPH-mo was detected in boring DE6 in the shallow interval at 1,400 mg/kg (see Plate 14) and in the deeper interval at 530 mg/kg (see Plate 15). The source of TPH in the vicinity of boring DE6 is likely associated with releases from the former actuators.

As discussed in Section 2.4, confirmation samples collected from actuator pit D (sample D-1 contained TPH-ho at 4,700 mg/kg) and pit E (sample E-1 contained TPH-ho at 22,000 mg/kg) contained levels of TPH-ho that exceed the ESL value of 2,500 mg/kg (i.e., Shallow Soil [ $<3$  meters] commercial ESL for TPH residual fuels). The highest concentration of TPH-ho was detected in the confirmation sample collected from actuator pit B (sample B-1 at 42,000 mg/kg). According to MW, sample B-1 was collected directly beneath a hydraulic oil line, and therefore MW considered this data point to be “anomalous.” Additional soil was removed by hand from the area where this sample was collected, but a second confirmation sample was not collected to confirm whether the contaminated soil had been removed because the initial results were considered to be “anomalous.” As shown on Plate 4, actuator pits B and D are adjacent to one another and are closest to boring DE7 where TPH-mo was detected at a maximum concentration of 19 mg/kg (see Plates 14 and 15). Actuator pit E is located adjacent to boring DE6 where, as discussed above, the maximum TPH-mo concentration was detected during the supplemental remedial investigation.

### **4.2.1.2 Metals in Soil**

The only metal detected above ESL values in the soil samples collected from borings DE1 and DE9 was cobalt at 15 and 13 mg/kg, respectively. The concentrations of cobalt in the deeper samples from these borings are slightly above the ESL of 10 mg/kg and likely represent background conditions. Further evidence supporting this conclusion is presented in Section 6.0.

Concentrations of arsenic, chromium, cobalt, and selenium in near-surface sample DESS1, which was collected in the unpaved area adjacent to the east side of the former Double-Enders Building, are above their respective ESL values (see Table 11). Metals results for the remaining three near-surface samples collected in this area are at concentrations below ESLs, except for the concentration of cobalt (at 19 mg/kg) in near-surface sample DESS3 (see Plate 4 for the location of near-surface samples DESS1 through DESS4). The concentrations of cobalt in near-surface sample DESS3 is only slightly above the ESL of 10 mg/kg and likely represents background conditions. Further evidence supporting this conclusion is presented in Section 6.0. Based on the distribution of metals in the near-surface samples it appears that elevated concentrations are limited to the vicinity of sample DESS1.

The source of elevated metals in near-surface sample DESS1 is suspected to be welding waste that appears to have been placed in the unpaved area on the east side of the former Double-Enders Building. Field observations indicated that recently placed fill material is present to a depth of approximately 0.5 ft. bgs and a poorly graded sand or silty sand is present from about 0.5 to 1 ft. bgs (i.e., maximum depth observed was 1 ft. bgs). Welding waste was observed in the 0.5 to 1 ft. bgs interval at near-surface sample location DESS1.

#### **4.2.2 Nature and Extent of Groundwater Contamination (Former Double-Enders Building)**

As indicated above, the nature and extent of VOCs in groundwater is not discussed because they were either not detected or detected at concentrations below ESLs in the vicinity of the former Double-Enders Building.

The distributions of petroleum hydrocarbons in groundwater at the former Double-Enders Building is presented on Plate 16. As shown on this plate, the concentration of TPH-mo in the grab groundwater sample collected from boring DE6 is above the ESL value. The extent of TPH-mo above the ESL of 2,500 µg/l is defined by the borings surrounding this location (see Plate 16). As discussed above, the source of TPH in this area is suspected to be releases associated with the former actuators.

#### **4.3 Nature and Extent of Contamination at the Former Internal Coating Building**

The nature and extent of soil and groundwater contamination at the former Internal Coating Building is presented below. TPH data from the recently conducted supplemental remedial investigation is presented on Plates 14 and 15 for soil and Plate 16 for groundwater. The nature and extent of VOCs in soil and groundwater is not discussed because VOCs were not detected in the vicinity of the former Internal Coating Building at concentrations above ESLs.

### **4.3.1 Nature and Extent of Soil Contamination (Former Internal Coating Building)**

#### **4.3.1.1 Petroleum Hydrocarbons in Soil**

As indicated on Table 14 and indicated on Plate 14, TPH-d and TPH-mo were detected at concentrations above their respective ESL values in the shallow soil sample collected from boring IC4. These constituents were not detected in the deeper sample collected from this boring (see Table 14 and Plate 15). This boring was completed adjacent to a shallow (approximately 1 to 1.5 feet deep), north/south trending concrete-lined grated pit where potential releases of heavy oils from machinery used in this concrete-floored building may have accumulated. This pit is the suspected source of TPH in soil at boring IC4. The extent of elevated TPH in soil south of boring IC4 has not been defined, but it is not expected to extend beyond the southern limit of the pit, which ends approximately 10 feet from the southern side of the building.

#### **4.3.1.2 Metals in Soil**

The only metals detected above ESL values in the soil samples collected from borings at the former Internal Coating Building were arsenic and cobalt. The concentrations of these constituents are slightly above their respective ESL values (see Table 16). Based on the metals results, it appears that the detected concentrations in the vicinity of the former Internal Coating Building represent background conditions. Further evidence supporting this conclusion is presented in Section 6.0.

### **4.3.2 Nature and Extent of Groundwater Contamination (Former Internal Coating Building)**

The distributions of petroleum hydrocarbons in groundwater at the former Internal Coating Building is presented on Plate 16. As shown on this plate, concentrations of TPH-d and TPH-mo in groundwater are below their respective ESL values throughout this building.

### **4.4 Nature and Extent of Contamination at the Former Acid Drain Line**

The soil distribution maps presented on Plates 14 and 15, and groundwater map presented on Plate 16, display the TPH data from the recently conducted supplemental remedial investigation. The nature and extent of VOCs in soil and groundwater is not discussed below because VOCs were either not detected or detected at concentrations below ESLs the vicinity of the former Internal Coating Building at concentrations above ESLs. In addition, the nature and extent of metals in groundwater is not discussed because metals were not detected above groundwater ESLs at this site.



#### **4.4.1 Nature and Extent of Soil Contamination (Former Acid Drain Line)**

##### **4.4.1.1 Petroleum Hydrocarbons in Soil**

The distributions of TPH-mo in soil in the vicinity of the former Acid Drain Line is presented on Plates 14 and 15. As shown on this plate, concentrations of TPH-mo in soil are below ESL values in this area. TPH-d in soil is also below its ESL value in this area (see Table 19).

##### **4.4.1.2 Metals in Soil**

Cobalt is only metal detected in soil at concentrations above ESLs (see Table 20). However, the concentrations of cobalt in the soil samples collected from borings in the vicinity of the former Acid Drain Line are only slightly above the ESL and likely represent background conditions. Further evidence supporting this conclusion is presented in Section 6.0.

#### **4.4.2 Nature and Extent of Groundwater Contamination (Former Acid Drain Line)**

Plate 16 shows the distribution of petroleum hydrocarbons in groundwater in the vicinity of the former Acid Drain Line. As indicated on this plate, concentrations of TPH-d and TPH-mo in groundwater are below their respective ESL values throughout this area.

The pH groundwater results for borings (i.e., TB62, TB63, and TB64) advanced in the suspected former pickling tank area, which ranged from 6.0 to 6.5, suggest that groundwater in this area is only slightly acidic and, therefore, have not been impacted by the suspected pickling activities.

#### **4.5 Conceptual Site Model**

Conceptual site models for the Fabrication Buildings Area and former Double-Enders Building are presented below. A conceptual site model for the former Internal Coating Building is not presented because contamination above the ESL, other than soil metals results that appear to represent background conditions, is limited to TPH-mo in one shallow soil sample. A conceptual site model is not present for the former Acid Drain Line because soil and groundwater results, other than soil metals results that appear to represent background conditions, were below ESLs.

##### **4.5.1 Fabrication Buildings Area Conceptual Site Model**

Based on the locations where elevated concentrations of TPH occur in soil and groundwater at Fabrication Buildings Area, suspected sources include:

- **Pre-Fab Building:** The source in this area is likely the suspected former UST location identified during the geophysical survey and UST verification investigation discussed in Sections 3.3 and 4.0; and

- **South Side Fabrication Bay 2:** The source in this area is not known.

The release from the suspected former UST location likely migrated vertically through the more permeable fill unit and then laterally outward along the water-bearing portions of the fill unit and along the contact between the fill and partially cemented silt/sand units (see cross section B-B' [Plate 6]). However, based on the deeper TPH soil results (see Plates 10 and 12), the partially cemented silt/sand unit (i.e., older alluvium on cross section B-B') appears to have impeded the downward migration of TPH.

The release on the south side of Fabrication Bay 2 appears to have been small and confined to the vicinity of boring TB22. Based on deeper TPH soil results (see Plates 10 and 12), the silt/clay unit (see cross section A-A' [Plate 5]) appears to have impeded the downward migration of TPH.

Once released, the TPH constituents in the Fabrication Buildings Area have generally not migrated significantly based on their distribution in groundwater (see Plates 13). The lack of plume migration can likely be attributed to flat gradients at the Facility, the low permeable nature of the silt/clay and partially cement silt/sand units, and natural attenuation.

#### **4.5.2 Former Double-Ender Building Conceptual Site Model**

The source of TPH in the former Double-Ender Building is likely associated with releases from the former actuators. As discussed in Section 2.4, TPH-ho-impacted soil was removed beneath six small hydraulic actuators in July of 1998. Confirmation samples collected from actuator pits D (sample D-1 contained TPH-ho at 4,700 mg/kg) and E (sample E-1 contained TPH-ho at 22,000 mg/kg) contained levels of TPH-ho that exceed the ESL value of 2,500 mg/kg. The releases from the actuators appear to have been localized, and, based on deeper TPH soil results (see Plate 15), the silt/clay and partially cemented silt/sand units appears to have impeded the downward migration of TPH.

Once released, the TPH constituents in the former Double-Ender Building have generally not migrated significantly based on their distribution in groundwater (see Plates 16). The lack of plume migration can likely be attributed to flat gradients at the Facility and natural attenuation. Also, based on the slow accumulation of groundwater in the borings completed in this building during the supplemental remedial investigation, it appears that the soils in this area have low permeability.

Based on the distribution of metals in the near-surface samples collected on the east side of the former Double-Ender Building, it appears that elevated concentrations are limited to the vicinity of sample DESS1. The source of elevated metals in near-surface sample DESS1 is suspected to be welding waste that appears to have been placed in this area. Based on field observations, it appears that welding waste is present in the upper foot of material in this area. Although deeper samples have not been collected in the vicinity of sample DESS1, it is

anticipated that metals contamination does not extend significantly beyond the upper foot where welding waste was observed.

## 5.0 CONTAMINANT FATE AND TRANSPORT

As part of the *Site 4 Characterization and Remedial Action Plan* (MW, 2000) and *Site 6 Characterization and Remedial Action Plan* (MW, 1996), MW discussed chemical fate and transport for TPH. Summaries of these fate and transport discussions are presented in Volumes 3 and 4 of this RI/FS/RAP. The summary below is based on the chemical fate and transport discussion in these remedial action plans.

In summary, MW indicated that constituent migration is induced primarily in the downgradient direction by the convective flow of groundwater (i.e., the natural movement of groundwater as represented by the average groundwater velocity). They also indicated constituent migration is slower than the groundwater because their migration is retarded by mechanisms of adsorption and natural attenuation. MW listed adsorption, hydrolysis, oxidation, reduction, and biodegradation as mechanisms of natural attenuation that retard migration.

Based on their analysis, MW indicated that adsorption may reduce TPH migration rates by a retardation factor of 8 (e.g., a retardation factor of 5 indicates that the migration of constituents is occurring at one-fifth of the groundwater velocity). Based on this low retardation factor, the potential for TPH to migrate from the areas with elevated TPH in groundwater (i.e., either the Pre-Fab Building area or the former Double-Enders Building) to the Napa River is low.

## 6.0 CHEMICALS OF CONCERN AND REMEDIATION EXTENT

This section summarizes the chemicals of concern (COC) identified during the investigations conducted at the Other Areas Sites, specifies the chemicals to be remediated and associated cleanup levels, and defines the extent of soil and groundwater media that will require remediation (i.e., the areas that exceed the cleanup levels).

### 6.1 Chemicals of Concern

Chemicals of concern for soil and groundwater were selected on the basis of the following primary factors:

- Frequency of detection. Chemicals detected at a frequency greater than 5% were further evaluated for possible retention as a COC;
- Exceedance of ESLs. If a chemical was frequently detected and soil or groundwater concentrations were above an ESL, the chemical was retained as a COC; and

- For metals, if detections were below background conditions, the metal was not retained as a COC.

### 6.1.1 Chemicals of Concern at the Fabrication Building Area

#### 6.1.1.1 Chemicals of Concern in Soil (Fabrication Buildings Area)

##### Organic Constituents in Soil

For soil, TPH-mo and TPH-d are considered the primary petroleum hydrocarbons requiring remediation. Table 24 summarizes the occurrence of petroleum hydrocarbons detected in soil samples collected from the Fabrication Buildings Area including their frequency of detection and number of detections above ESLs. TPH-d and TPH-mo are retained as COCs in soil.

##### Metals in Soil

For metals, the following constituents were detected above their respective ESL (see Table 25):

- **Antimony** – Detected in 1 sample above its ESL;
- **Arsenic** – Detected in 7 samples above its ESL;
- **Chromium** – Detected in 9 samples above its ESL;
- **Cobalt** – Detected in 15 samples above its ESL;
- **Nickel** – Detected in 1 sample above its ESL; and
- **Thallium** – Detected in 5 samples above it ESL.

Table 25 summarizes the maximum and minimum concentration for each metal along with the frequency of detection, the number of detections above the ESL and the background concentrations for each metal (as available)<sup>6</sup>. With the exception of the maximum chromium and nickel detections of 110 mg/kg and 170 mg/kg, respectively, the arsenic, chromium, and nickel detections do not exceed their respective background concentrations (see Table 25). Background concentrations have not been established for antimony, cobalt, and thallium.

Seven arsenic detections were above the ESL of 5.5 mg/kg, but none of the concentrations were above the background value of 15.3 mg/kg that has been established for arsenic in soil at the Facility (Table 25). Because of the slight exceedance of the ESL in only 7 of 31 samples and the likelihood that the detected arsenic concentrations represent background conditions, arsenic is not retained as a COC.

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<sup>6</sup> Background metals concentrations in soil were developed by James M. Montgomery in a Corrective Action Plan prepared for the Facility in 1990 (JMM, 1990b).

Chromium was detected in each of 31 samples analyzed for this constituent, but only one concentration, 110 mg/kg, is above the ESL (58 mg/kg). This concentration is slightly above the background value of 98 mg/kg that has been established for chromium in soil at the Facility (Table 25). Because of the slight exceedance of the ESL and background value in only one sample and the likelihood that the detected chromium concentrations represent background conditions, chromium is not retained as a COC.

Fifteen cobalt detections were above the ESL of 10 mg/kg; no background value has been established for cobalt in soil at the Facility (Table 25). Studies of California soils have identified background cobalt concentrations that range from 2.7 to 46.9 mg/kg<sup>7</sup> or, in terms of the 95<sup>th</sup> percentile derived from Department of Toxic Substances Control's (DTSC's) study, 22.0 mg/kg<sup>8</sup>. As was done in the ESL document (RWQCB, 2005), metals were compared to background concentrations in soil at the Lawrence Berkeley Laboratory (LBL, 2002). The background concentrations established for cobalt at the LBL is 25 mg/kg. With the exception of the two highest cobalt concentrations of 27 and 33 mg/kg, the concentrations of cobalt in soil do not exceed 25 mg/kg. However, these cobalt concentrations are only slightly above the background concentrations established for LBL and are below the range identified above for studies of California soils. By comparison with the available California studies, cobalt is considered to represent background conditions and is not carried forward as a chemical of concern.

Nickel was detected in each of 31 samples analyzed for this constituent, but only one concentration, 170 mg/kg, is above the ESL (150 mg/kg). This concentration is slightly above the background value of 125 mg/kg that has been established for nickel in soil at the Facility (Table 25) and below the LBL background value for nickel of 270 mg/kg (LBL, 2002). Because of the slight exceedance of the ESL and background value in only one sample and the likelihood that the detected nickel concentrations represent background conditions, nickel is not retained as a COC.

Antimony was detected in 4 of 31 samples analyzed for this constituent, but only one concentration, 12 mg/kg, is above the ESL (6.1 mg/kg); no background value has been established for antimony in soil at the Facility. DTSC's study indicated a 95<sup>th</sup> percentile of 12.0 mg/kg for California soils. Because of the slight exceedance of the ESL in only one sample and the likelihood that the detected antimony concentrations represent background conditions, antimony is not retained as a COC.

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<sup>7</sup> Kearney Foundation of Soil Science, 1996. *Background Concentrations of Trace and Major Elements in California Soils*. March.

<sup>8</sup> Hunter, Philip M., Davis, Brian K., and Frank Roach, 2005. *Inorganic Chemicals in Ground Water and Soil: Background Concentrations At California Air Force Bases*. Presented at: 44<sup>th</sup> Annual Meeting of the Society of Toxicology, New Orleans, Louisiana. March 10. Available on DTSC's website at [http://www.dtsc.ca.gov/AssessingRisk/upload/Metals\\_Handout.pdf](http://www.dtsc.ca.gov/AssessingRisk/upload/Metals_Handout.pdf)

Five thallium detections were slightly above the ESL of 1.0 mg/kg; no background value has been established for thallium in soil at the Facility (Table 25). Studies of California soils have identified background thallium concentrations that range from 0.17 to 1.10 mg/kg<sup>7</sup> or, in terms of the 95<sup>th</sup> percentile derived from DTSC's study, 25.0 mg/kg<sup>8</sup>. As was done in the ESL document (RWQCB, 2005), metals were compared to background concentrations in soil at the LBL (LBL, 2002). The background concentrations established for thallium at the LBL is 10 mg/kg. The thallium concentrations are below both the background concentrations established for LBL and DTSC's 95<sup>th</sup> percentile. By comparison with the available California studies, thallium is considered to represent background conditions and is not carried forward as a chemical of concern.

#### 6.1.1.2 Chemicals of Concern in Groundwater (Fabrication Buildings Area)

Both TPH-d and TPH-mo are frequently detected in groundwater and exceeded their respective ESLs (Table 26). Similar to soil, TPH-d and TPH-mo are considered the primary COCs for groundwater.

### **6.1.2 Chemicals of Concern at the Former Double-Ender Building**

#### 6.1.2.1 Chemicals of Concern in Soil (Former Double-Ender Building)

##### Organic Constituents in Soil

Table 27 summarizes the occurrence of petroleum hydrocarbons detected in soil samples collected at the former Double-Ender Building including their frequency of detection and number of detections above ESLs. As indicated on this table, TPH-d, TPH-mo, and TPH-ho were all frequently detected (i.e., using a 5% frequency of detection as the criterion), but only TPH-ho exceeded its respective ESL. Therefore, TPH-ho is the only petroleum hydrocarbon retained as a COC in soil.

##### Metals in Soil

For metals, the following constituents were detected above their respective ESL (see Table 28):

- **Arsenic** – Detected above its ESL in near-surface sample DESS1;
- **Chromium** – Detected above its ESL in near-surface sample DESS1;
- **Cobalt** – Detected in 4 samples above its ESL, including near-surface sample DESS1; and
- **Selenium** – Detected above its ESL in near-surface sample DESS1.

Table 28 summarizes the maximum and minimum concentration for each metal along with the frequency of detection, the number of detections above the ESL and the background concentrations for each metal (as available)<sup>6</sup>.

Arsenic was detected in 8 of 9 samples, but only one concentration is above the ESL of 5.5 mg/kg. However, the arsenic result of 120 mg/kg in near-surface sample DESS1 is significantly above the ESL and background value of 15.3 mg/kg that has been established for arsenic in soil at the Facility (Table 28). Therefore, arsenic is retained as a COC for the near-surface soils on the east side of the former Double-Enders Building in the vicinity of sample DESS1.

Chromium was detected in 8 of 9 samples, but only one concentration, 67 mg/kg in near-surface sample DESS1, is above the ESL (58 mg/kg). This concentration is below the background value of 98 mg/kg that has been established for chromium in soil at the Facility (Table 28). Because of the slight exceedance of the ESL in only one sample and the likelihood that the detected chromium concentrations represent background conditions, chromium is not retained as a COC.

Four cobalt detections were above the ESL of 10 mg/kg; no background value has been established for cobalt in soil at the Facility (Table 28). As discussed above, Studies of California soils have identified background cobalt concentrations that range from 2.7 to 46.9 mg/kg<sup>7</sup> or, in terms of the 95<sup>th</sup> percentile derived from DTSC's study, 22.0 mg/kg<sup>8</sup>. Also, the background concentrations established for cobalt at the LBL is 25 mg/kg (see discussion above). Of the four cobalt detections above the ESL, only the maximum result of 63 mg/kg for near-surface sample DESS1 exceeds the background concentrations of these available California studies. Therefore, cobalt is retained as a COC for the near-surface soils on the east side of the former Double-Enders Building where welding waste has been observed.

Similar to arsenic, selenium was only detected above the ESL (10 mg/kg) in near-surface sample DESS1. Selenium was detected at a concentration of 35 mg/kg in this sample, which is significantly above the ESL and background value of 0.9 mg/kg that has been established for selenium in soil at the Facility (Table 28). Therefore, selenium is retained as a COC for the near-surface soils on the east side of the former Double-Enders Building in the vicinity of sample DESS1.

#### 6.1.2.2 Chemicals of Concern in Groundwater (former Double-Enders Building)

Both TPH-d and TPH-mo are frequently detected in groundwater at the former Double-Enders Building. However, only TPH-mo exceeded its respective ESLs (Table 29). Therefore, TPH-mo is retained as a COCs for groundwater.

### 6.1.3 Chemicals of Concern at the Former Internal Coating Building

#### 6.1.3.1 Chemicals of Concern in Soil (Former Internal Coating Building)

##### Organic Constituents in Soil

Table 30 summarizes the occurrence of petroleum hydrocarbons detected in soil samples collected at the former Internal Coating Building including their frequency of detection and number of detections above ESLs. As indicated on this table, TPH-d and TPH-mo frequently detected (i.e., using a 5% frequency of detection as the criterion), and exceeded their respective ESLs in one sample. Therefore, TPH-d and TPH-mo are retained as a COC in soil.

##### Metals in Soil

For metals, the following constituents were detected above their respective ESL (see Table 31):

- **Arsenic** – Detected in 1 sample above its ESL; and
- **Cobalt** – Detected in 4 samples above its ESL.

Table 28 summarizes the maximum and minimum concentration for each metal along with the frequency of detection, the number of detections above the ESL and the background concentrations for each metal (as available)<sup>6</sup>.

Arsenic was detected in 6 of 6 samples, but only one concentration is above the ESL of 5.5 mg/kg. However, none of the concentrations were above the background value of 15.3 mg/kg that has been established for arsenic in soil at the Facility (Table 31). Because of the slight exceedance of the ESL in only 1 sample and the likelihood that the detected arsenic concentrations represent background conditions, arsenic is not retained as a COC.

Four cobalt detections were above the ESL of 10 mg/kg; no background value has been established for cobalt in soil at the Facility (Table 31). As discussed above, Studies of California soils have identified background cobalt concentrations that range from 2.7 to 46.9 mg/kg<sup>7</sup> or, in terms of the 95<sup>th</sup> percentile derived from DTSC's study, 22.0 mg/kg<sup>8</sup>. Also, the background concentrations established for cobalt at the LBL is 25 mg/kg (see discussion above). Of the four cobalt detections above the ESL, only the maximum result of 29 mg/kg exceeds the 95<sup>th</sup> percentile derived from DTSC's study, but this concentration is within the background concentration range of 2.7 to 49.9 mg/kg for California soils. By comparison with the available California studies, cobalt is considered to represent background conditions and is not carried forward as a chemical of concern.



#### 6.1.3.2 Chemicals of Concern in Groundwater (Former Internal Coating Building)

Both TPH-d and TPH-mo are frequently detected in groundwater at the former Internal Coating Building. However, neither exceeded its respective ESLs (Table 32). Therefore, TPH-d and TPH-mo are not retained as a COCs for groundwater.

### **6.1.4 Chemicals of Concern at the Former Acid Drain Line**

#### 6.1.4.1 Chemicals of Concern in Soil (Former Acid Drain Line)

##### Organic Constituents in Soil

Table 33 summarizes the occurrence of petroleum hydrocarbons detected in soil samples collected at the former Acid Drain Line including their frequency of detection and number of detections above ESLs. As indicated on this table, TPH-d and TPH-mo were frequently detected (i.e., using a 5% frequency of detection as the criterion), but did not exceed their respective ESLs. Therefore, TPH-d and TPH-mo are not retained as a COC in soil.

##### Metals in Soil

Table 34 summarizes the maximum and minimum concentration for each metal along with the frequency of detection, the number of detections above the ESL and the background concentrations for each metal (as available)<sup>6</sup>. As indicated on this table, cobalt was the only metal detected above its ESL. Cobalt was detected in 5 of 6 samples, and each detected concentration is above the ESL (10 mg/kg); no background value has been established for cobalt in soil at the Facility (Table 34). However, the concentrations are within the background concentration range of 2.7 to 49.9 mg/kg<sup>7</sup> for California soils and none of the concentrations exceed the 95<sup>th</sup> percentile derived from DTSC's study (i.e., 22.0 mg/kg<sup>8</sup>). By comparison with the available California studies, cobalt is considered to represent background conditions and is not carried forward as a chemical of concern.

#### 6.1.4.2 Chemicals of Concern in Groundwater (Former Acid Drain Line)

Both TPH-d and TPH-mo are frequently detected in groundwater at the former Acid Drain Line. However, neither exceeded its respective ESLs (Table 35). Therefore, TPH-d and TPH-mo are not retained as a COCs for groundwater.

### **6.1.5 Summary of Chemicals of Concern**

Using the sorting process described above, the following chemicals were retained as chemicals of concern for soil and groundwater at the Sites. As an indication of the relative importance of each COC, a summary of the number of samples exceeding the ESLs is also included.

### **Fabrication Buildings Area**

Soil:

- TPH-d: 3 samples; and
- TPH-mo: 1 sample.

Groundwater:

- TPH-d: 4 samples; and
- TPH-mo: 3 samples.

### **Former Double-Ender Building**

Soil:

- TPH-ho: 2 samples;
- Arsenic: 1 sample;
- Cobalt: 1 sample; and
- Selenium: 1 sample.

Groundwater:

- TPH-mo: 1 sample.

### **Former Internal Coating Building**

Soil:

- TPH-d: 1 sample; and
- TPH-mo: 1 sample.

Groundwater:

- None.

**Former Acid Drain Line**

Soil:

- None.

Groundwater:

- None.

**6.1.6 Cleanup Levels for Chemical of Concern**

As described in detail in Section 1.1, the ESLs were selected for use as cleanup levels for the Other Areas Sites. For the soil and groundwater COCs at the Other Areas Sites, the cleanup levels are as follows:

**Soil:**

<u>Parameter</u>	<u>Residential ESLs (mg/kg)</u>			<u>Commercial ESLs (mg/kg)</u>		
	<u>Shallow Soil</u> <u>(0-3 ft. bgs)</u>	<u>Shallow Soil</u> <u>(3-10 ft. bgs)</u>	<u>Deep Soil</u> <u>(&gt; 10 ft.</u> <u>bgs)</u>	<u>Shallow Soil</u> <u>(0-3 ft. bgs)</u>	<u>Shallow Soil</u> <u>(3-10 ft. bgs)</u>	<u>Deep Soil</u> <u>(&gt; 10 ft.</u> <u>bgs)</u>
TPH-d	100	400	5,000	500	750	5,000
TPH-mo	500	1,000	5,000	2,500	2,500	5,000
TPH-ho	500	1,000	5,000	2,500	2,500	5,000
Arsenic	5.5*	5.5*	5.5*	5.5*	5.5*	5.5*
Cobalt	10*	10*	10*	10*	10*	10*
Selenium	10	10	2,500	10	10	3,400

\* Cleanup to ESLs is the goal; however, background metals concentrations may be used to evaluate if cleanup has been attained. The 95% upper confidence limit (95 UCL) may be calculated from verification soil sample data and compared to the arsenic and cobalt background values (15.3 and 25 mg/kg, respectively).

**Groundwater:**

<u>Parameter</u>	<u>Nondrinking Water ESL</u> <u>(µg/l)</u>
TPH-d	2,500
TPH-mo	2,500

**6.2 Areas Requiring Remediation**

This section identifies the portions of the Sites where soil or groundwater concentrations exceed the applicable cleanup levels and are therefore the target of remedial actions.

### 6.2.1 Areas and Volumes of Soil Exceeding Cleanup Levels

As described in Section 6.1, TPH-d and TPH-mo were the primary COCs detected above their respective cleanup levels in soil. The one exception to this is arsenic, cobalt, and selenium detected in near surface soils at sample location DESS1 near the former Double-Ender Building. The aerial extent and volume of soil requiring remediation is defined by the soil samples that exceed the cleanup levels for TPH (see Plates 17 through 20).

#### **Fabrication Buildings Area**

**Unsaturated Soil.** For unsaturated soils, the TPH data results presented on Plates 9 and 11 were used to delineate the area where it is likely that TPH concentrations exceed the cleanup levels; this area is shown on Plate 17. As shown on Plate 17, there is only one relatively small and isolated area around boring TB22 where TPH-d exceeds its cleanup level; this area is approximately 600 square feet (sf) in size. Assuming an unsaturated zone thickness of 4 ft, the in-place volume of unsaturated soil that exceeds the cleanup levels in this area is approximately 90 cubic yards (cy).

**Saturated Soil.** For saturated soils, the TPH data presented on Plates 10 and 12 were used to delineate the area where it is likely that TPH concentrations exceed the cleanup levels. In addition to this soil data, information presented in these plates regarding the estimated extent of the separate-phase/sheen area was used to delineate the area where saturated soil likely exceeds the soil cleanup levels; this area is shown on Plate 18. Based on this data, the only area where TPH-d exceeds the soil cleanup level in the saturated zone is near the eastern side of the Pre-Fab Building near borings TB5 and TB57. This area is approximately 3,200 square feet (sf) in size. Assuming a saturated zone thickness of 6 ft, the in-place volume of unsaturated soil that exceeds the cleanup levels in this area is approximately 700 cubic yards (cy).

#### **Former Double-Ender Building**

**Unsaturated Soil.** The only COCs that exceed cleanup levels in the unsaturated zone at the former Double-Ender Building are arsenic, cobalt, and selenium. As noted above, these metals that were detected above cleanup levels around sample location DESS1 on the east side of the former Double-Ender Building appear to be associated with welding wastes observed between 0.5 ft and 1 ft bgs. As shown on Plate 19, this is approximately 4,000 square feet (sf) in size. Assuming that the entire unsaturated zone thickness of 4 ft is impacted (a very conservative assumption), the in-place volume of unsaturated soil that exceeds the metals cleanup levels in this area is approximately 590 cubic yards (cy).

**Saturated Soil.** For saturated soils, the only area where TPH concentrations exceed the cleanup levels is around borings DE6 and DE7 (actuator pits “E” and “B”, respectively) for TPH-ho. These areas are shown on Plate 20 and include a total area of approximately 1,400 sf in size. It is assumed that the impacted saturated soil zone extends from 4 ft to 10 ft.

Therefore, assuming a saturated thickness of 6 ft, the in-place volume of saturated soil that exceeds the cleanup levels in this area is approximately 300 cubic yards (cy).

### **Former Internal Coatings Building**

**Unsaturated Soil.** The only COC that exceeds its cleanup level in the unsaturated zone at the former Internal Coating Building is TPH-mo at boring IC4. As shown on Plate 19, this small area is approximately 600 square feet (sf) in size. Assuming that the unsaturated zone thickness of 4 ft is impacted, the in-place volume of unsaturated soil that exceeds the TPH-mo cleanup level in this area is approximately 90 cubic yards (cy).

**Saturated Soil.** For saturated soils, no COCs were found above their respective cleanup levels.

### **Former Acid Drain Line**

- **Unsaturated Soil:** For unsaturated soils, no COCs were found above their respective cleanup levels.
- **Saturated Soil:** For saturated soils, no COCs were found above their respective cleanup levels.

### **Summary of Soil Volumes**

The total volume of soil exceeding cleanup level for all of the Other Areas (i.e., the Fabrication Buildings Area, former Double-Enders Building, former Internal Coatings Building, and the former Acid Drain Line) is estimated to be:

- **Unsaturated Soil:** 180 cy exceeding a TPH cleanup level and 590 cy exceeding one or more metals cleanup levels; and
- **Saturated Soil:** 1,000 cy exceeding a TPH cleanup level.

## **6.2.2 Areas and Volumes of Groundwater Exceeding Cleanup Levels**

### **Fabrication Buildings Area**

As described in Section 6.1.1.2, the primary groundwater COCs that exceed their respective cleanup levels are TPH-d and TPH-mo. As shown on Plate 13, a total area of approximately 34,700 sf has TPH concentrations exceeding the cleanup levels, including the 3,200 sf area that also exceeds the soil cleanup levels. Assuming the same 6 ft thick saturated thickness as for the saturated soils, the total in-place volume of saturated soil in the area exceeding groundwater cleanup levels is 7,700 cy, including the 700 cy of soil that exceeds the soil cleanup levels in this area (see Plate 18).

### **Former Double-Ender Building**

As shown in Plate 20, the only area where a groundwater COC exceeds its respective cleanup level is the TPH-mo area around boring DE6. As shown on Plate 20, a total area of approximately 1,700 sf has TPH concentrations exceeding the cleanup levels that includes: (1) the 650 sf where saturated soil exceeds the cleanup levels around boring DE6 and (2) an additional 950 sf where only groundwater concentrations exceed the cleanup levels. Assuming the same 6 ft thick saturated thickness as for the saturated soils, the total in-place volume of saturated soil in the area exceeding groundwater cleanup level is 360 cy, including the 150 cy that exceeds the soil cleanup levels at DE6.

### **Former Internal Coatings Building**

No groundwater samples collected around the former Internal Coating Building had COCs exceeding their cleanup levels.

### **Former Acid Drain Line**

No groundwater samples collected around the former Acid Drain Line investigation area had COCs exceeding their cleanup levels.

## **7.0 FEASIBILITY STUDY SCOPING**

### **7.1 Scope of the Feasibility Study**

This feasibility study is focused on developing remedial actions that address soil and groundwater affected by COCs identified at the sites, primarily petroleum hydrocarbons and the isolated instance of metals contamination near the former Double-Ender Building. As defined in Section 6.2, the areas where soil and groundwater exceed applicable cleanup levels are shown in Plates 17 through 20. For soils, it is estimated that there is approximately 180 cy of unsaturated soil exceeding TPH cleanup levels, 590 cy of unsaturated soil exceeding metals cleanup levels and approximately 1,000 cy of saturated soil that exceed the applicable soil the cleanup levels (TPH-d, -mo, and -ho). Contaminants in groundwater not only exceed groundwater cleanup levels in the area where saturated soils exceed soil cleanup levels, but also exceed groundwater cleanup levels (primarily for TPH compounds) in an area approximately 32,500 sf in size adjacent to the contaminated soil areas; almost all of this is in the Fabrication Buildings Area (see Plates 18 and 20). This area, where only groundwater cleanup levels are exceeded, is estimated to encompass another approximately 7,210 cy of saturated soil.

This feasibility study specifically addresses the Site, and the conclusions and recommended remedial action can be implemented independently of other remedial actions being considered elsewhere at the Napa Pipe Facility. It is important to recognize, however, that the

remediation of the Site will potentially be conducted concurrent with the other areas of contamination (e.g., Site 2/3, Site 4, Site 6) and that although some differences do exist between the various sites, the contaminant types are generally similar from site to site. This similarity in contaminant types leads to the possibility that certain remediation technologies will likely have applicability to more than one site and economies of scale may be recognized. See Volume I for a more detailed discussion of how the remediation activities of the different sites will be integrated. The one exception to the similarities between the different sites is the metals contamination in the shallow soil around boring DESS1 – this appears to be an isolated situation that will be dealt with separately from the mainly TPH and VOC-related contamination observed elsewhere at the Napa Pipe Facility.

## **7.2 Applicable or Relevant and Appropriate Requirements and “To Be Considered” Factors for Impacted Soil and Groundwater**

In developing remedial action objectives, Applicable or Relevant and Appropriate Requirements (“ARARs”) must be considered. ARARs are described in 40 CFR Paragraph 300.430(e)(2)(i) and derived from the National Oil and Hazardous Substances Contingency Plan (“NCP”), set forth in 40 CFR Part 300. The selected remedial alternative must comply with the ARARs. It should also, to the extent practicable, reflect and account for other regulatory policy and criteria that while not necessarily legally applicable, are “to be considered” (TBC) during the development of remedial actions. ARARs and TBCs can be subdivided into three categories:

- **Chemical specific ARARs and TBCs** are health-based or risk-based standards that define the allowable limits of specific chemical constituents detected in or discharged to the environment. Cleanup and discharge levels that determine Site remedial goals can be provided by chemical specific ARARs. The RWQCB’s Environmental Screening Levels (ESLs) are examples of potential chemical specific TBCs;
- **Location-specific ARARs and TBCs** can apply to natural features located on a site, such as the presence of endangered species, seasonal wetlands, or flood plains and to man-made features and institutional factors, including zoning requirements, landfills, and locations of archaeological or historical significance. Location-specific ARARs restrict the types of remedial actions that can be implemented based on the site-specific characteristics or location; and
- **Action-specific ARARs and TBCs** are activity-based or technology-based limitations that can set design and performance restrictions. These ARARs specify engineering controls and permit requirements that must be instituted during site activities, or restrict specific activities. The Federal Occupational Safety and Health Administration (OSHA) regulations regarding worker health and safety requirements, and California OSHA (Cal-OSHA) requirements for noise control and dust control during construction are examples of action specific ARARs.

### 7.2.1 Potential Chemical-Specific ARARs and TBCs

The primary potential chemical-specific ARARs for the Sites are as follows:

- Federal Drinking Water Standards (40 CFR Part 141) and California Drinking Water Standards (22 CCR Section 64435) or MCLs;
- Porter-Cologne Water Quality Control Act, California Water Code, Division 7, Section 13000 et seq.; and
- National Pretreatment Standards (40 CFR Part 403).

The following are the identified potential chemical-specific TBCs for the property:

- RWQCB's Screening For Environmental Concerns at Sites With Contaminated Soil and Groundwater (4th edition, February 2005).

### 7.2.2 Potential Location-Specific ARARs and TBCs

The National Archeological and Historic Preservation Act (16 USC Section 469, 36 CFR Part 65) is the only location-specific ARAR identified for the Sites. Although wetlands are located southwest and west of the Site, they are not located within or near the areas requiring remediation.

### 7.2.3 Potential Action-Specific ARARs and TBCs

Identified action-specific ARARs and TBCs for the property are presented below. The following are potential action-specific ARARs for the Sites:

- Resource Conservation and Recovery Act (RCRA) regulations (40 CFR Parts 261 through 268; and California Code of Regulations [CCR] Sections 66261 through 66268);
- Land Disposal Unit Criteria (40 CFR Part 264.221, et seq., 22 CCR Section 66264.221, et seq.);
- Clean Water Act (40 CFR Parts 100-149), including National Pollutant Discharge Elimination System (NPDES) Permit Requirements;
- Safe Drinking Water and Toxics Enforcement Act of 1986 (Proposition 65), State of California;
- Hazardous Materials Transportation Regulations (49 CFR Part 107, 171-177);
- Clean Air Act (42 USC Section 7401, et seq.);



- Applicable Napa County Codes and Ordinances;
- Bay Area Air Quality Management District (BAAQMD) Rules and Regulations: Organic Compounds, Regulation 8; and Hazardous Pollutants, Regulation 11;
- Occupational Safety and Health Administration (29 CFR Part 1910.120 et seq.); and
- Cal-OSHA (Title 8).

The following are potential action-specific TBCs for the property:

- San Francisco Bay Basin Plan, Region 2, Water Quality Control Plan.

### **7.3 Additional Factors for Remedial Action Objective Development**

In addition to the regulatory requirements summarized above in Section 7.2, there are several significant non-regulatory considerations applicable to the remedial actions at the Napa Pipe Facility that in general play a substantial role in the future land use and evaluation of remedial technologies and alternatives, and ultimately in the selection of a recommended remedial action plan for Other Area Sites. These additional factors include:

- **Unrestricted Land Use.** Napa County is currently updating its General Plan. Use of substantial portions of the Site for residential purposes is within the range of plans currently being studied. Accordingly, to maximize the long-term protectiveness of remedial alternatives relative to the foreseeable land uses, remedial actions at the Site should, to the extent practicable, achieve cleanup levels without extensive use of institutional or engineering controls to control or limit exposure. In other words, cleanups should remediate soil and groundwater to below risk-based cleanup levels and leave the Site with no, or as few as possible, restrictions or long-term remedial actions (e.g., deed restrictions, monitoring, maintenance of engineering controls) as possible;
- **Need for Clean Imported Soil.** Remedial actions that result in soils being transported off-site will likely require the importing of the same volume of clean soil back onto the Site. In addition, the conceptual redevelopment plan for the Napa Pipe Facility includes raising the ground surface approximately 2 to 3 feet using imported soil. This presents an opportunity for soils excavated from one remedial site to be treated, as necessary, and placed as fill in other portions of the Facility in order to achieve final grade requirements;
- **Timeframe to Achieve Cleanup.** In light of the County's on-going planning process and currently anticipated redevelopment proposals, remedial actions should be completed, and the cleanup objectives for the Site met, in a relatively short timeframe; and

- **Available Area for Remedial Actions.** The Napa Pipe Facility is quite large (approximately 150 acres), the majority of which is not known to be contaminated and is available for use in the various remedial actions, including the remediation of the Site. This available land can be used for soil stockpiling, used to locate treatment systems (e.g., thermal treatment systems for soil) or processing areas (e.g., open areas for use as “landfarms”), or as a final location for placement of treated soils. Portions of the Facility, especially the southern portion, are to be zoned commercial within the Napa County Airport flyover zone. Therefore, cleanup standards in those commercially-zoned areas are proposed to be consistent with those uses.

These additional factors will influence the remedial strategies to be considered. For example, use of containment technologies such as capping, slurry walls, or hydraulic control (groundwater extraction) will not meet cleanup levels for groundwater or soil in a timely fashion and thereby would require extensive institutional and engineering controls.

## **7.4 Remedial Action Objectives**

Remedial Action Objectives (RAOs) are goals specific to a facility, area, or to an affected medium (e.g., soil or groundwater) that are developed for protection of the environment and human health. RAOs for affected soil and groundwater are intended to guide remedial actions that mitigate the identified potential threats to human health and the environment. These objectives should be developed in a manner consistent with reasonably foreseeable future Site uses (i.e., residential and commercial uses). RAOs can address both chemical concentrations and potential exposure pathways. The RAOs for soil and groundwater, described in Sections 7.4.1 and 7.4.2, respectively, were developed based on the conceptual model described in Section 4.5, the cleanup levels defined for the site in Section 6.1.6, the ARARs listed in Section 7.2, and the additional factors described above in Section 7.3.

### **7.4.1 RAOs for Soil**

The following RAOs have been developed for soil:

- Reduce concentrations of COCs in soil to below the lowest applicable cleanup level listed in Section 6.1.6 to the maximum extent practicable; and
- Minimize the use of and reliance on institutional and/or engineering controls to the extent practicable.

### **7.4.2 RAOs for Groundwater**

The following RAOs have been developed for groundwater:

- Reduce concentrations of COCs in groundwater to below the lowest applicable cleanup levels listed in Section 6.1.6 to the maximum extent practicable; and

- Minimize the use of and reliance on institutional and/or engineering controls to the extent practicable.

## **7.5 General Response Actions**

General response actions (GRAs) are broad categories of remedial actions that may be used alone or in combination with other GRAs to achieve the RAOs for the site. The GRAs that are potentially applicable to the remediation of the Site include:

- **No Action:** A “no action” alternative is required to be evaluated as a baseline alternative against which other remedial alternatives are compared. No other remedial action would be conducted;
- **Institutional Controls:** Institutional controls, such as deed restrictions on land use or resource restrictions (e.g., water use restrictions), can be used to supplement engineering controls or in conjunction with active remedial alternatives to reduce or limit exposure to hazardous substances. As discussed in Section 10, even though institutional controls are in general not as protective of human health and the environment as active remediation, they will be retained as a GRA to address situations where they cannot be avoided;
- **Engineering Controls:** Engineering controls are physical measures that prevent or minimize exposure to hazardous substances or reduce the mobility or migration of hazardous substances and can be combined with institutional controls, as required, to achieve protection of human health and the environment. Although engineering controls typically require long-term maintenance and, as mentioned above for institutional controls, tend to be somewhat less protective than active remediation, they will be retained as a GRA to address situations where their use cannot be avoided; and
- **Active Remediation:** These remedial actions include a broad range of technologies designed to remove or destroy contaminants in specific media. Active remedial actions typically are more protective of human health and the environment compared to the no action alternative as well as institutional and engineering controls. Active remedial actions are generally preferred because they: (1) provide the best long-term protection of human health and the environment, (2) result in the reduction of the mobility, toxicity, and volume of contaminants, and (3) restore the property to its highest productive use. In this feasibility study, active remedial actions are evaluated for soil and groundwater and each of these categories is further subdivided into: (1) *in situ* remediation options; and (2) *ex situ* remediation options. Active remediation for soil utilizing on-site treatment and off-site disposal are also evaluated.

## 8.0 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES

Remedial technologies are actions that can be implemented at the site to address one or more of the RAOs. There may be more than one technology and associated processes that could be appropriate for any portion of a remedial site. Once identified, the potentially applicable technologies are screened based on specific criteria to determine if they should be retained for use in development of remedial alternatives. This section describes the process and the results of identifying and screening remedial technologies potentially applicable to achieving the RAO requirements at the Site.

### 8.1 Preliminary Technology Identification and Screening

#### 8.1.1 Technology Identification

Potentially applicable conventional and innovative remedial technologies and cleanup processes were identified and evaluated to address the RAOs. A preliminary list of potential applicable technologies were identified based on the physical and chemical nature of the Site contaminants (primarily TPH-mo, TPH-d, and TPH-ho), the impacted media (soil and groundwater), the Site conditions (shallow groundwater table, extent of contamination, subsurface lithology), and the RAOs. Tables 36a and 36b list the potentially applicable remediation technologies and processes for soil and groundwater, respectively, that were evaluated to identify those that would be retained for development of the remedial alternatives.

The one exception to the TPH-contaminated media is the arsenic, cobalt, and selenium impacted near-surface soils at sample location DESS1 near the former Double-Enders Building. Because this soil contains contaminants very different from the rest of the contaminants at the Napa Pipe Facility (i.e., metals instead of organic compounds such as TPH and VOCs), and because there appears to be a very limited quantity of this material located in the shallow soils (not in groundwater or deeper soils), the FS will assume a presumptive approach of excavation and off-site disposal for these metal-impacted soils. Therefore, the technology identification and screening described in this section will focus only on the TPH-related contaminants.

In addition to chemical-specific technology limitations, implementing a remedy at the Site is limited by several constraints including:

- **Buildings and Structures.** Buildings or structures currently occupy a significant portion of the Site. For purposes of this FS, it is assumed that existing structures, including building foundations, will be removed prior to initiating remedial actions;
- **Subsurface Utilities.** Subsurface utilities, including water, gas, electric, and product lines, are likely located throughout the affected area. Because of the age of the Facility, the location and depth of some subsurface piping and utilities is not known with certainty. For purposes of this FS, it is assumed that subsurface utilities will be removed or deemed insignificant for remedial implementation purposes, prior to initiating remedial actions; and

- **Existing Monitoring Well Extraction System Abandonment.** Existing monitoring wells and the extraction system that are within, or adjacent to, areas where remedial activities could damage the wells, or monitoring wells that will no longer be needed, will be abandoned as part of demolition and site preparation activities prior to initiating remedial actions.

### 8.1.2 Technology Screening

Screening of the potentially applicable technologies for the TPH-related contamination used the following criteria to determine whether a potential remediation technology and process was appropriate for achieving the site RAOs:

- **Effectiveness** – the ability to treat the Site contaminants and meet the RAOs;
- **Implementability** – constraints or difficulties in implementing the technology and verifying effectiveness; and
- **Cost** – estimated costs for construction, operation, and maintenance of the technology to meet the RAOs. Cost was used to differentiate between technologies or process options that had similar effectiveness and implementability but significantly different costs.

Based on the screening criteria, technologies were either retained for use in development of remedial alternatives or eliminated from consideration. The screening process for soil and groundwater technologies is summarized in Tables 36a and 36b, respectively, including the rationale for retaining or eliminating particular technologies. The technologies retained for use in development of remedial alternatives are described in more detail in the sections below.

## 8.2 Soil Treatment Technologies

The affected soil area and volume at the Site are specified in Section 6.2.1 and shown in Plates 17 through 20. As noted in Section 6.1, the primary non-metal COCs in the soil at the Site are TPH-mo and TPH-d, which are present in concentrations that exceed its cleanup level in the unsaturated and saturated zones. As noted above, the presumptive approach to addressing the limited quantity of shallow soil exceeding metals cleanup level will be to dispose of it off-site in a licensed landfill. Potentially applicable technologies include those that are capable of effectively destroying or removing the contaminants in either zone. The soil remediation technologies can destroy the contaminants *in situ* within the subsurface or *ex situ* following excavation. Reducing contaminant concentrations in the soil will also reduce the potential for migration of contaminants to groundwater, thereby increasing the efficiency of subsequent groundwater cleanup.

Fourteen preliminary soil treatment technologies were identified and screened against the criteria defined above. These include conventional as well as alternative and innovative technologies. The results of the screening process are shown in Table 36a. Of the

14 technologies that were identified, six were retained for further evaluation after initial screening and are described in more detail below.

### **8.2.1 Excavation**

Contaminated soils can be excavated using standard construction techniques and equipment, such as excavators, bulldozers, and scrapers. Excavated soils can then be managed using other remediation technologies depending on contaminant type and concentration, cleanup levels, and regulatory requirements. Limiting factors related to excavation include:

- Excavation of impacted soils may expose potentially volatile contaminants to the atmosphere and may require respiratory protection for workers or other nearby receptors as well as special excavation techniques to limit emissions;
- Excavation of saturated soils may require dewatering with subsequent management of the impacted groundwater generated by the dewatering activities;
- Shoring or other slope stabilization techniques (e.g. lay backs) will likely be required for excavations greater than 4 ft depth, and especially for excavations below the groundwater table; and
- Backfilling of excavations in the saturated zone may require importing engineered fill.

Because excavation is an implementable technology that would effectively remove the contaminated soil from the subsurface thereby eliminating the potential for future exposures and eliminating the potential for the soil to act as a source of groundwater contamination, and because it is a required first step when using *ex situ* treatment and soil management approaches, excavation will be retained for further evaluation.

### **8.2.2 Ex Situ Low Temperature Thermal Desorption**

Low Temperature Thermal Desorption (LTTD) is an *ex situ* remedial technology that uses heat to increase the volatility of the contaminants and physically separate them from the soil. The impacted soil is excavated and placed in a thermal desorption unit where it is heated. The system is designed to separate contaminants from the soil rather than destroy them. A vacuum system is used to convey the volatilized products to a vapor treatment system where the contaminants are treated prior to atmospheric discharge. There are two common thermal desorption types: the rotary dryer and thermal screw.

Rotary dryers are horizontal cylinders that can be indirect or direct fired. Most rotary systems use an inclined rotating metallic cylinder where the soil is heated. For the thermal screw systems, hollow augers transport the soil through a jacketed trough and the soil is indirectly heated. All thermal desorption systems require treatment of the volatilized vapors to remove particulates and contaminants. Particulates are removed by wet scrubbers or fabric filters, and

contaminants are removed by carbon adsorption or destroyed in a secondary combustion chamber or catalytic oxidizer.

The maximum temperature is limited by the material properties of the heated components. For LTDD, the soil is heated to between 200 and 600°F. Target contaminants are nonhalogenated VOCs and fuels with destruction efficiencies in the vapor phase treatment system of greater than 95 percent. The treated soil retains its physical properties, and unless heated to the higher end of the temperature range, natural organic components are not damaged. Limiting factors include:

- Large particles and debris – adversely impacts material handling, pre-feed requirements, and destruction efficiencies;
- Moisture – adversely impacts material handling, residence time, heating requirements, and destruction efficiencies. At moisture concentrations greater than 20 percent, drying the soil prior to the LTDD is highly recommended;
- Highly abrasive feed (e.g., large gravel and rocks) - adversely impacts desorber operation (may result in damage);
- High contaminant concentrations – adversely impacts desorber operation (may result in overheating and damage), handling requirements (may require blending), and disposal options;
- Heavy metals - adversely impacts treated soil (potentially requiring stabilization) and disposal options; and
- Clay and silty soils - adversely impacts reaction time as a result of contaminant binding or soil sticking to the cylinder.

Because the primary contaminants in soil (TPH-d, TPH-mo) are effectively treated using this technology, and the soil type and overall contaminant concentrations are suitable, and because it is implementable, *ex situ* LTDD was retained for further evaluation.

### 8.2.3 Biopiling

Biopiles are an *ex situ* remediation technology that involves stockpiling excavated soils into aboveground cells with interlayered process piping and systems to introduce fresh air, nutrients, and moisture as needed to stimulate aerobic biodegradation of the target contaminants. Biopiles are specifically constructed to optimize conditions for aerobic activity. The soils can be blended as needed to increase air permeability, homogeneity, and microbial population and ensure sufficient oxygen, moisture, and nutrients can be supplied throughout the pile. Measures are required to prevent contaminated vapors from being released into the atmosphere or liquids from draining into previously clean soil and groundwater. Additionally, regular monitoring is necessary to ensure optimization of biodegradation rates, track

contaminant concentration reductions, and ensure ambient air and groundwater quality are not impacted. Limiting factors include:

- Soils with high percentage of fines and a high degree of saturation – adversely impacts air flowrates;
- Separate phase product – adversely impacts contaminant biodegradation rates (may be toxic to the microorganisms);
- Low contaminant concentrations – adversely impacts contaminant biodegradation rates due to less substrate for the microorganisms;
- High molecular weight compounds – adversely impacts contaminant biodegradation rates;
- Colder, wet climates – adversely impacts contaminant biodegradation rates (may require climate control measures); and
- High contaminant volatility – impacts system operation (may require treatment technology).

Because the primary contaminants in soil (TPH-d, TPH-mo) may be effectively treated using this technology, the treatment costs may be less when compared to *ex situ* LTDD, and it can be implemented in the available space, biopiling was retained for further evaluation.

#### **8.2.4 Landfarming**

The technology is the same as described for biopiles except the excavated soils are spread in a thin layer on the ground. Soil aeration is generally accomplished by tilling or plowing rather than by engineered measures such as process piping and air introduction systems. Because of the larger area of the land farm as compared to the biopiles, additional measures may be necessary to prevent soil and wind erosion and control surface water runoff and dust generation.

Because the primary contaminants in soil (TPH-d, TPH-mo) may be effectively treated using this technology, the treatment costs may be less when compared to *ex situ* LTDD or biopiling, and there may be sufficient available space to implement this technology, landfarming was retained for further evaluation.

#### **8.2.5 In Situ Chemical Oxidation**

This is an *in situ* remedial technology where chemical oxidants are injected into the subsurface to chemically convert contaminants into non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert. For *in situ* soil treatment, this technology is almost exclusively applied to saturated soil; unsaturated soils (i.e., vadose zone) are very difficult to



treat *in situ* using this technology due to problems associated with chemical delivery, distribution and contact in the soil.

The chemical oxidants most commonly used include hydrogen peroxide, persulfate, ozone, and permanganate. These oxidants have been able to cause rapid and complete chemical destruction of toxic organic compounds, and other organics have become amenable to subsequent bioremediation. The technology can achieve destruction efficiencies greater than 90% for unsaturated aliphatic compounds (e.g., trichloroethylene [TCE]), aromatic compounds (e.g., benzene), and fuel-related organics with fast reaction rates. Matching the oxidant and delivery method to the contaminants and site conditions is critical to successful implementation and achieving performance goals. Limiting factors include:

- Soils with high percentage of fines – can adversely impact distribution of chemical oxidants within the target treatment zone;
- Soils with highly stratified lithology – adversely impacts the uniform delivery of chemical oxidants;
- The quantities of chemical oxidants required to ensure that target contaminants are oxidized can be large which may adversely impact handling and safety requirements;
- Indiscriminant and rapid reactions with other oxidant-consuming substances (natural organic matter, reduced minerals, carbonate, and other free radical scavengers) increase oxidant demand and can adversely impact contaminant destruction; and
- Inadvertent oxidation induced effects – adversely impacts soil properties (may decrease pH, generate colloids that result in reduced permeability, mobilize sorbed metals, form toxic byproducts, and increase temperatures and contaminated vapors).

Because the primary contaminants for the Other Areas (TPH-d and TPH-mo) are amenable to treatment using this technology, chemical oxidation was retained for further evaluation. Site soils are not ideal for *in situ* technologies such as chemical oxidation, but the relatively shallow distribution of contaminants and thin treatment zone may make implementation of oxidants feasible.

#### **8.2.6 Off-Site Disposal**

Impacted soil can be excavated and then disposed of at a permitted off-site landfill. The specific landfill that soil may be taken to will depend in part on the characterization of the soil with respect to state and federal hazardous waste regulations. Given the relatively high cost of off-site disposal, and the additional cost associated with replacing all soils taken off-site with imported fill, it is not anticipated that off-site disposal will be used as the primary approach for managing excavated soil. As noted above, off-site disposal is the presumptive approach to address the limited quantity of shallow soil exceeding metals cleanup levels. Therefore, off-site disposal was retained for further evaluation.

### **8.3 Groundwater Treatment Technologies**

The affected groundwater area at the Site and volume of saturated soil associated with this affected groundwater are specified in Section 6.2.2 and shown on Plates 18 and 20. As noted in Section 6.1, the primary COCs in the groundwater at the Site are TPH-mo and TPH-d.

Identified potentially applicable technologies include those that are capable of effectively destroying or removing the contaminants. The groundwater remediation technologies can destroy the contaminants *in situ* within the subsurface or *ex situ* following extraction or excavation of the saturated soil.

Ten preliminary groundwater treatment technologies were identified and screened against the criteria defined above. These included conventional as well as alternative and innovative technologies. The results of the screening process are shown in Table 36b. Of the ten technologies that were identified, two *ex situ* technology and two *in situ* technologies were retained for further evaluation after initial screening and are described in more detail below.

#### **8.3.1 *In Situ* Enhanced Bioremediation**

This *in situ* technology refers to addition of oxygen, nutrients, co-substrates, and/or other amendments to the groundwater to increase whatever natural aerobic and/or anaerobic biodegradation rates that may be ongoing. The existing microorganisms are used to metabolize the organic contaminants in the groundwater. Limiting factors include:

- Soils with high percentage of fines – can adversely impact distribution of oxygen, nutrient, co-substrates, and other amendments within the target zone;
- Excessive localized microorganism growth – adversely impacts system operation (may result in clogging nutrient and water injection wells);
- Soils with highly stratified lithology – adversely impacts delivery of oxygen, nutrients, co-substrates, and other amendments to the microorganisms;
- High contaminant concentrations/separate-phase product – adversely impacts contaminant biodegradation rates (may be toxic to the microorganisms);
- Very low contaminant concentrations – adversely impacts contaminant biodegradation rates due to less substrate for the microorganisms; and
- High molecular weight compounds – adversely impacts contaminant biodegradation rates.

The primary COCs in groundwater at the Site (TPH-d and TPH-mo) would be effectively treated using enhanced biodegradation and the technology can be readily implemented at the

Site. Saturated Site soils are not ideal for *in situ* technologies such as enhanced bioremediation, but relatively shallow distribution of contaminants makes effective application of amendments more feasible.

### 8.3.2 *In Situ* Chemical Oxidation

This *in situ* technology uses oxidizing agents to oxidize and destroy organic contaminants. This is a direct chemical reaction involving the application or injection of oxidants into the target zone to destroy or chemically transform the contaminants. Efficient oxidation depends on the reaction potential and the effective contact between oxidant and contaminant. Subsurface heterogeneities, preferential flow paths, and poor mixing in the subsurface may result in inefficient treatment. Additionally, oxidation is non-specific, and the oxidant will be consumed not only by the contaminant, but also by natural demands within the target zone. These include other organic material and reduced-state metals.

There are a number of oxidants that are potentially usable, including ozone, persulfate, hydrogen peroxide, and permanganate. Of these, ozone, persulfate, peroxide, and permanganate are the most widely used and are generally commercially available. Some oxidants (e.g., ozone and peroxide) are very strong and effective, but also rapidly decompose which can limit the ability to distribute them in the subsurface. Permanganate and persulfate are also strong oxidants and do not decompose as readily as peroxide and ozone and therefore can be easier to distribute in the subsurface. Matching the oxidant and delivery method to the contaminants and site conditions is critical to successful implementation and achieving performance goals. Limiting factors include:

- Saturated soils with high percentage of fines can adversely impact distribution of chemical oxidants within the target treatment zone;
- Saturated soils with highly stratified lithology may present preferential flow pathways that can adversely impact the uniform delivery of chemical oxidants;
- The quantities of chemical oxidants required to ensure target contaminants are oxidized can be large which may adversely impacts handling and safety requirements;
- Indiscriminant and rapid reactions with other oxidant-consuming substances (natural organic matter, reduced minerals, carbonate, and other free radical scavengers) increase oxidant demand and can adversely impact contaminant destruction; and
- Inadvertent oxidation induced effects – adversely impacts soil properties (may decrease pH, generate colloids that result in reduced permeability, mobilize sorbed metals, form toxic byproducts, and increase temperatures and contaminated vapors).

Because chemical oxidation would effectively treat the primary contaminants for the Site (TPH-d and TPH-mo), it was retained for further evaluation. Site conditions are not ideal for *in situ*

technologies such as chemical oxidation, but the relatively shallow distribution of contaminants and thin treatment zone may make implementation of oxidants feasible.

### 8.3.3 Saturated Soil Excavation

This is an *ex situ* technology that involves physically removing the contaminated groundwater by excavating the saturated soil within the groundwater plume boundaries. Excavation for removal of contaminated soils (i.e., with COCs exceeding soil cleanup levels) is discussed in Section 8.2.1. Excavated saturated soil would be managed on-site through drying, treatment, or other appropriate methods and used as fill. Provisions are necessary to remove and control groundwater within the excavation boundaries. The excavation boundaries will overlap into clean areas to ensure the entire volume of the groundwater plume is removed. Limiting factors include:

- Excavation of saturated soil becomes increasingly more difficult and expensive the deeper contamination extends below the water table;
- High permeability saturated soils may result in excessive amounts of groundwater being generated by dewatering of the excavation, significantly increasing difficulty and cost; and
- Large excavations may require phased implementation.

Because contamination is relatively shallow at the Site and the soils are generally low permeability, excavation of saturated soils is an effective and implementable approach and will quickly remove the groundwater plume.

### 8.3.4 Existing Wastewater Treatment System

Excavation would require management of contaminated groundwater generated during dewatering activities. The Facility has an existing wastewater treatment system that discharges into the sanitary sewer under a permit with the Napa County Sanitation District. This system includes storage tanks, chemical injection systems (flocculant injection), settling tanks, an oil/water separator, and is maintained and periodically sampled to meet discharge requirements. Groundwater generated during dewatering can be treated using this existing wastewater treatment system and discharged to the sanitary sewer under the existing permit. If additional treatment is required to remove dissolved organic constituents (TPH) to below permit limits, a series of granular activated carbon vessels can be added as a polishing step prior to discharge.

## **8.4 Summary of Retained Remedial Technologies**

The technologies retained for use in alternative development include:

### **Soil Technologies**

- Excavation;
- *Ex Situ* Low Temperature Thermal Desorption;
- Bio-Piling;
- Landfarming;
- Off-Site Disposal; and
- *In Situ* Chemical Oxidation.

### **Groundwater Technologies**

- *In Situ* Enhanced Bioremediation;
- *In Situ* Chemical Oxidation;
- Saturated Soil Excavation; and
- Existing Wastewater Treatment System.

These technologies include *in situ* and *ex situ* technologies for both soil and groundwater. All of the retained technologies are likely to be effective at treating the Site contaminants, are implementable, have costs that are not disproportionate to other retained technologies, and will likely meet the RAOs, but optimizing the manner in which these technologies may be utilized most effectively (and therefore most cost-effectively) will likely require limited treatability studies during the design process. Based on the results of these treatability studies and the variability in contaminant concentrations present at the Site, it is likely that one technology may be most effective at treating soil and/or groundwater with lower contaminant concentrations whereas another technology may be most effective for higher concentrations.

## **9.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES**

Remedial alternatives are combinations of technologies designed to meet the RAOs. The technologies retained from the screening process were assembled into the three remedial alternatives described below that could treat the contaminants in soil and groundwater and protect public health. Each remedial alternative is described in the following sections with respect to conceptual design, implementation, effectiveness and performance, estimated

cleanup time, and estimated cost. The conceptual design is developed in sufficient detail to conduct the detailed comparative evaluation of the alternatives (Section 10).

The duration of remedy alternatives was estimated using engineering judgment and general knowledge of the remediation technologies. Depending on the nature of the alternative, the duration of the cleanup can be difficult to predict because numerous site conditions and processes impact the effectiveness of the remediation technologies that make up an alternative. Therefore, the alternatives were compared on the basis of the estimated relative effectiveness of the technologies and the likelihood that cleanup could be achieved in a timeframe consistent with the reasonably foreseeable future land use.

The costs of the remedial alternatives discussed below were developed by accounting for capital costs as well as recurring and future costs. Capital costs include workplans, design reports, other agency-required documents, and construction to implement the remedy. Recurring and future costs include groundwater monitoring, operation and maintenance, and reporting.

A contingency cost of 30 percent was added to each alternative to reflect a level of uncertainty in the estimated costs. The contingency on capital cost reflects uncertainty in construction costs. The contingency on recurring and future costs generally reflects uncertainty of the operation and maintenance costs and the duration of the remedy. These cost estimates should be considered accurate to a range of minus 30 percent to plus 50 percent of the estimated cost. The cost estimates are rounded to the nearest \$10,000.

### **9.1 Approach to Developing Remedial Alternatives**

The approach to developing remedial alternatives for the Site is based both on the requirements of the RAOs and on the technologies retained based on the screening conducted in Section 8.0. The RAOs require that the remediation achieve cleanup levels minimizing the use of institutional or engineering controls after remediation is completed. These requirements are consistent with the general policies of state and federal cleanup regulations and guidance that favor remedial strategies that clean up and restore contaminated sites and that accommodate the range of reasonably foreseeable land uses. Since the anticipated future use of the Site includes residential development, remedial approaches relying on containment or risk-management approaches were not preferred.

The NCP requires that “no action” alternative be evaluated, and one is included in the development and evaluation of alternatives below. Typically, where existing remedial measures have occurred or are ongoing, an alternative is included in the feasibility study that, to varying degrees, maintains the existing remedial actions. At the Site, the existing RWQCB orders (Order No. 90-147 and Order No. R2-2205-0012) require, among other things, ongoing groundwater monitoring to document groundwater contaminant levels. While these existing engineering and institutional controls would not, either by themselves or in conjunction with

other similar measures, meet the RAOs for the Site, a remedial alternative based on the existing measures is included for evaluation in the FS.

### 9.1.1 General Remediation Approaches

Rather than developing separate remedial alternatives to evaluate each of the technologies individually, both the *in situ* and *ex situ* technologies will be retained and evaluated together as separate “tool boxes” for soil and groundwater remediation. The specific “tools” to be used in an alternative are defined in the alternative descriptions below. If an alternative is selected for implementation, the manner in which the tool box technologies would be applied may be optimized during design and in conjunction with the other remedial actions being conducted at other sites within the Napa Pipe Facility.

With respect to developing remedial alternatives that meet the RAOs, this tool box approach leads to the following two general remedial alternatives that will be evaluated:

- An *in situ* approach for groundwater and some soils, excluding the primary source area. Unsaturated soil exceeding the ESLs and highly contaminated soils within the primary source area will be addressed using *ex situ* technologies; and
- An all *ex situ* approach that involves excavation of all soil and groundwater (i.e., saturated soil) exceeding cleanup levels and managing the excavated soils using one of more of the *ex situ* treatment technologies, as needed.

An *in situ* approach for all saturated soil and groundwater, including the primary source area, is not deemed feasible due to the uncertainties about effectively treating the source area soil where separate-phase product may be present and the associated very high costs in attempting this type of treatment.

Additional development of the tool box approach for *in situ* and *ex situ* remediation is provided below, followed by a detailed description of the remedial alternatives to be evaluated in the FS.

### 9.1.2 In Situ Tool Box

The retained technologies for *in situ* remediation of soil and groundwater consists of enhanced bioremediation and chemical oxidation. These technologies can be implemented separately or, depending on the chemistry utilized, together in a complimentary way.

For purposes of this FS, the *in situ* approach would consist of injecting a combination of sodium persulfate and calcium peroxide. Sodium persulfate is a stable, highly soluble, crystalline material, which upon activation generates the sulfate radical, a very strong oxidant, capable of oxidizing a broad range of recalcitrant compounds including fuel hydrocarbons. The calcium peroxide has a dual activating effect on the persulfate by the release of peroxide and by creating alkaline conditions. The degradation of the calcium peroxide would also provide a longer term source of oxygen which would enhance the biodegradation of the

petroleum-related contaminants. Finally, the sulfates generated by the reaction of persulfate can be also utilized by sulfate bacteria. These sulfate bacteria can assist in the bioremediation of the contaminants when the aquifer is converted from an aerobic system to an anaerobic system following consumption of oxygen by bacteria that aerobically degrade the petroleum hydrocarbons.

This dual chemical blend will be introduced to the subsurface through a series of injections. Geoprobe technology would be used to advance injection rods to the maximum depth of the vertical contaminant treatment zone (e.g., 10 ft. bgs). The chemicals will be injected through the bottom of the rods into the surrounding formation as the rods are retracted upwards through the entire length of the vertical contamination zone. The rate and total volume of treatment chemistry injected into the formation would be monitored to ensure an even distribution of treatment chemistry throughout the entire length of the vertical contamination zone. Once injected, the chemicals will disperse into the saturated zone through advective transport and dispersion.

As noted in Section 8.4, treatability studies would be required during design to confirm that: (1) the sodium persulfate/calcium peroxide blend is the appropriate chemistry for the Site (a bench-scale study) and (2) that the chemicals can be effectively delivered to the subsurface and achieve the cleanup levels for soil and groundwater (a pilot field-scale study).

As noted above, this *in situ* approach is best suited to saturated soil and groundwater outside of the primary source area and is not readily applicable to the primary source area or unsaturated soil. The source area and unsaturated soils will be addressed by *ex situ* technologies in all remedial alternatives developed below.

### **9.1.3 *Ex Situ* Tool Box and Soil Management Protocol**

The first step in any *ex situ* remediation approach is removing the affected media from the subsurface so it can be managed using other technologies. For both soil and groundwater, excavation would be the approach used, with groundwater being “excavated” by removing the saturated soil (including the groundwater) as well as by the incidental dewatering that might be required as part of excavating below the water table.

Once removed from the subsurface, the soil would be segregated and managed using the tool box of *ex situ* treatment technologies consistent with a soil management protocol that will be developed during remedial design and documented in a Remedial Design and Implementation Plan (RDIP). The RDIP will be a document that presents a detailed protocol for managing all soil excavated not only at the Site, but for all remedial actions at the Napa Pipe Facility. With respect to the soils from the Site, the soil management protocol would utilize the *ex situ* treatment technologies retained in Section 8.0. Based on analytical testing results, soil would be segregated into the general categories listed below and managed by category as follows:



- **Clean Overburden** – Unsaturated soil with contaminant concentrations below the cleanup levels that has to be excavated to access contaminated saturated soils or groundwater below. This soil would be stockpiled near the excavation and then reused as backfill (assuming it is suitable from a geotechnical perspective) after remedial activities are completed;
- **Soil Exceeding Residential ESLs but Below Commercial Cleanup Levels** – Unsaturated or saturated soil that has concentrations of COCs in excess of the residential cleanup levels but below the commercial cleanup levels would be transported to commercially-zoned areas (e.g., the areas south of the External Coating Building), dried as necessary, and used as fill in these areas without further treatment;
- **Soil Exceeding both Residential and Commercial Cleanup Levels** – Unsaturated or saturated soil that has concentrations of COCs in excess of both residential and commercial cleanup levels would be transported to a central stockpile area for contaminated soil and treated using one or more of the treatment technologies in the “tool box”. Soil falling in this general category would likely be further segregated (e.g., unsaturated vs. saturated, total TPH concentrations greater than 30,000 mg/kg) to facilitate effective treatment. Once treated to below cleanup levels, the soil would be used as fill at the Facility; and
- **Saturated Soil from Groundwater Plume Areas** – Saturated soils located in areas where concentrations of COCs in groundwater exceed groundwater cleanup levels, but COC concentrations in soil are below soil cleanup levels, would be transported to a stockpile area, dried as necessary, and used as fill at the Facility (residential or commercially-zoned areas) without further treatment.

Three of the four categories (1, 2, and 4) defined above would not require that the excavated soil be treated prior to use as fill at the Facility. For the third category, some treatment of the soil would be required before the soil can be used as fill. One or more of the following retained *ex situ* treatment technologies would be used:

- Biopiling;
- Landfarming; and
- *Ex Situ* Low Temperature Thermal Desorption.

All of these technologies are able to effectively treat the Site contaminants and the manner in which they would be utilized are defined in the alternative descriptions below. During development of the soil management protocol and the RDIP, the implementation approach will be optimized based on a variety of factors including contaminant concentrations of specific soil, the type and quantity of soil being remediated elsewhere at the Facility, the results of treatability studies, and refined cost estimates based on a detailed design.

Finally, off-site disposal is also retained for use as part of the soil management protocol for those situations when unusual soil conditions and/or the presence of other contaminant types not currently identified (e.g., metals) are encountered. In these situations, other on-site treatment technologies may not be suitable and off-site disposal may be required.

## **9.2 Alternative 1 – No Action**

### **9.2.1 Alternative Description**

The “no action” alternative is required by the NCP. In this alternative, no cleanup of soil or groundwater would be conducted and no additional groundwater monitoring would be conducted.

### **9.2.2 Cost**

There is little or no cost associated with implementing the no action alternative.

## **9.3 Alternative 2 – Groundwater Monitoring**

### **9.3.1 Alternative Description**

In this alternative, a network of groundwater monitoring wells will be installed and monitored in a manner similar to that required under the RWQCB orders for other portions of the Napa Pipe Facility<sup>9</sup>. For cost estimating purposes, it is assumed that 20 new monitoring wells will be installed to cover the four sub-areas (i.e., Fabrication Buildings Area, former Double-Ender Building, former Internal Coating Building, and former Acid Drain Line) and the groundwater monitoring program is assumed to continue for 20 years.

### **9.3.3 Cost**

The capital cost for installing the 20 wells is estimated to be \$150,000, based on a per well cost of \$5,000, plus design and contingency costs. The annual monitoring costs for Alternative 2 is estimated to be \$45,000. The net present value of the O&M costs for this alternative over the durations defined above, and assuming an effective annual interest rate<sup>10</sup> of 5%, is \$560,000. The total estimated cost (net present value) of implementing Alternative 2 (capital costs plus 20 years of O&M) is \$710,000.

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<sup>9</sup> In the FS discussions for Sites 2/3, 4, and 6, Alternative 2 was based on maintaining the existing remedial actions being performed under the current RWQCB orders. In general, these existing actions include limited groundwater extraction for hydraulic control of the plumes, and ongoing groundwater monitoring. Because the Other Areas are not covered under the existing orders, Alternative 2 for this FS will be developed to be similar in scope and approach to Alternative 2 for the other sites.

<sup>10</sup> Effective interest rate equals interest rate minus inflation rate.

## **9.4 Alternative 3 – Ex Situ Source Area Soil and Groundwater Treatment and In situ Groundwater Plume Remediation**

### **9.4.1 Alternative 3 Description**

Alternative 3 consists of two major components: (1) excavation and *ex situ* treatment of source area saturated and unsaturated soils and groundwater and (2) *in situ* treatment of groundwater exceeding cleanup levels but outside of the source area. The excavation of the source area would be conducted first in order to both remove the source contaminants and also to induce hydraulic gradients from the surrounding plume areas toward the excavation through dewatering activities. The dewatering would not only remove some of the contaminated groundwater for treatment, but the increased hydraulic gradients may assist in the distribution of the chemical oxidants to be used in the *in situ* treatment phase of the remediation. As noted above, the limited quantity of shallow soil exceeding metals cleanup level near the former Double-Ender Building will be managed using the presumptive approach of excavation and off-site disposal at a licensed landfill.

**Excavation and Ex Situ Treatment of Source Area Soil and Groundwater.** For purposes of this FS, the source area of the Sites is defined as including: (1) unsaturated soils exceeding the cleanup levels for TPH compounds (see Plates 17 and 19) and (2) the saturated soil and groundwater located in the area where saturated soils exceed the soil cleanup levels for TPH compounds (Plates 18 and 20). As described in Section 6.2, these two areas include 180 cy and 1,000 cy of soil, respectively, for a total excavation volume rounded up to approximately 1,200 cy.

The approach for managing the excavated soil is described above in Section 9.1.3, with the soil being segregated into categories based on contaminant levels and managed consistent with a soil management protocol. Where treatment is required to achieve cleanup levels, technologies in the “tool box” would be utilized as defined below. The initial excavation would be the unsaturated soils exceeding cleanup levels and the clean overburden required to be removed to access the underlying saturated zone soils. The clean overburden would be stockpiled nearby for later use as backfill, and the soil exceeding the cleanup levels would be segregated by contaminant level and taken to the appropriate stockpile and/or treatment area for processing as defined below.

Next, the source area saturated zone would be excavated. Although the exact method of excavating the saturated zone will be defined in the RDIP, it will likely involve some form of dewatering. Groundwater generated during excavation dewatering, which will contain elevated contaminant levels, will be collected and transported to the existing wastewater treatment system for pretreatment prior to discharging to the sanitary sewer under the Facility’s existing permit. It is assumed that granular activated carbon (GAC) adsorption vessels will be added to the existing treatment system to reduce the dissolved organic level prior to discharge. As with the unsaturated soils, the excavated saturated soils will be segregated by contaminant level and taken to the appropriate stockpile and/or treatment area for processing. If these saturated soils

require the additional step of drying before they can be further treated, they will be spread and dried in a separate area designed such that water draining from the soil can be collected and treated on site.

The technologies retained in the “tool box” for managing soil *ex situ* include biopiling, landfarming, low temperature thermal desorption, and off-site disposal. Based on the available information and for purposes of developing a cost estimate for this FS, it is assumed that excavated soils will be managed as follows:

- Approximately 120 cy (10 percent) would have contaminant levels below commercial cleanup levels and can be used directly as fill in the commercially-zoned areas (after drying if necessary);
- Approximately 600 cy of the soil (50 percent), generally those with low to moderate contaminant levels, would be treated directly using biopiling techniques to at least commercial cleanup levels and used as fill in the commercially-zoned areas;
- Approximately 360 cy of the soils (30 percent), generally those with moderate to high contaminant levels, would be treated using low temperature thermal desorption; and
- Approximately 120 cy of the soil (10 percent) would require off-site disposal.

The above percentages are based on general technology limitations and available contaminant distribution information and are intended to be representative of technologies retained in the “tool box”. As noted above, during development of the soil management protocol and the RDIP, the implementation approach will be optimized based on a variety of factors as well as detailed analysis of COC concentrations or specific requirements for individual technologies.

Once the excavation is completed, it would be backfilled using a combination of recycled concrete (generated during demolition of the existing facility building foundations) and imported granular fill to the approximate elevation of the water table and then using clean overburden, clean imported fill, or potentially soils treated to below the residential ESLs. In order to prevent the recontamination of the clean backfill in the saturated zone, amendments may be added to the backfill to promote enhanced biodegradation of contaminants in groundwater that flow back into the former excavation.

Verification soil samples would be collected from the excavation areas using a hand sampler and earthmoving equipment to evaluate whether the target cleanup levels have been met. Verification sample analyses would likely be performed utilizing an expedited laboratory turnaround schedule, or an on-site mobile laboratory, in order to reduce the likelihood for significant delays to affect the remedial action schedule. In addition to verification soil sampling, it is anticipated that soil gas samples would be collected from shallow soil to confirm that residual contamination that may be present at depth, although below applicable soil or groundwater ESL values, is not causing an exceedance of a soil gas ESL. Should laboratory

analytical results indicate that the cleanup level has not been attained, additional excavation will be performed.

**Excavation and Off-site Disposal of Metals-Impacted Soil.** As noted previously, the only area where metals concentrations exceed cleanup levels in soil is the near-surface soil around boring DESS1 adjacent to the former Double-Ender Building (see Plate 19). Assuming that the full 4-ft-thick unsaturated zone contains metals above the cleanup levels, this area includes approximately 590 cy of soil. This soil will be excavated and transported off-site to a secure, permitted landfill for disposal.

***In Situ* Treatment of Source Area Soil and Groundwater.** The area where groundwater exceeds cleanup levels outside the source area is shown on Plates 18 and 20. As described in Section 6.2, this area comprises approximately 32,500 sf (0.75) acres and contains an estimated 7,200 cy of saturated soil. The general approach to the *in situ* treatment of the groundwater in this area is described above in Section 9.1.2 and consists of *in situ* chemical oxidation and enhanced bioremediation using a sodium persulfate/calcium peroxide blend. For cost estimating, it is assumed that the blend would consist of a 5 to 1 mix of 25 percent sodium persulfate and 25 percent calcium peroxide.

Based on the existing information, the sodium persulfate/calcium peroxide mixture would be injected using Geoprobe technology. For cost estimating, it is assumed the injection points would be spaced approximately 10 ft apart, and with an assumed average radius of influence of approximately 6 ft, this should provide overlap of the coverage provided by each injection point. With this assumed spacing, it would take approximately 290 injection locations to effectively treat the target area.

Monitoring the effectiveness of the *in situ* treatment would be accomplished through a network of monitoring wells installed in the treatment area before the injections occur. Several pre-injection monitoring events would be conducted to establish pre-treatment baseline concentrations. Post-treatment monitoring would be conducted to confirm that cleanup levels have been achieved and that no “rebound” of contaminant concentrations is occurring. A typical post-treatment monitoring program would consist of a round of sampling 2 weeks after injection, 6 weeks after injection, 3 months after injection, and then quarterly for three events to provide a year of monitoring data. If cleanup levels in certain areas are not met initially, or concentrations “rebound”, additional injections of oxidant may be required.

In addition to the groundwater monitoring described above, it is anticipated that soil gas samples would be collected from shallow soil to confirm that residual groundwater contamination, although below their respective soil or groundwater cleanup levels, is not causing an exceedance of a soil gas ESL.

### 9.4.2 Cost

The estimated costs associated with implementing Alternative 3 are shown in Table 37. The capital costs for Alternative 3 include excavation and treatment of TPH-contaminated source soils, excavation and off-site treatment of metals-contaminated soils, *in situ* treatment of groundwater, placing treated soil as fill, amending the backfill to promote biodegradation of residual contaminants, and managing groundwater generated during dewatering. Operations and maintenance (O&M) costs associated with Alternative 3 are limited to short-term post-treatment monitoring of the *in situ* treatment area.

The estimated capital costs for Alternative 3 range from a low of \$570,000 to a high of \$910,000, with an average capital cost of \$740,000. Average O&M costs are estimated at \$135,000 assuming one year of post-treatment monitoring. Total remediation costs for Alternative 3, using the average capital and O&M costs, are estimated at \$880,000. It is assumed that implementation of Alternative 3 would begin in 2008 and that all capital costs will be incurred during 2008, although some *ex situ* soil treatment activities could extend into 2009. O&M costs (groundwater monitoring) would extend into 2009.

## 9.5 Alternative 4 – *Ex Situ* Soil and Groundwater Remediation

### 9.5.1 Alternative Description

The primary component of Alternative 4 is the excavation and *ex situ* treatment of all saturated and unsaturated soils and groundwater that exceed their respective cleanup levels for TPH-compounds. As noted above, the limited quantity of shallow soil exceeding metals cleanup level near the former Double-Enders Building will be managed using the presumptive approach of excavation and off-site disposal at a licensed landfill.

**Excavation and *Ex Situ* Treatment of TPH-Impacted Soil and Groundwater.** The areas that would be excavated are defined in Plates 17 through 20. As described in Section 6.2, the estimated volume of soil exceeding cleanup levels for TPH compounds includes 180 cy of unsaturated soil and 1,000 cy of saturated soil. The area where only groundwater exceeds cleanup levels (Plates 18 and 20) contains an additional 7,200 cy of saturated soil. The total estimated volume of soil to be excavated (rounded up) in Alternative 4 is approximately 8,400 cy.

The approach for managing the excavated soil is described above in Section 9.1.3, with the soil being segregated into categories based on contaminant levels and managed consistent with a soil management protocol. Where treatment is required to achieve cleanup levels, technologies in the “tool box” would be utilized as defined below. The initial excavation would be the unsaturated soils exceeding cleanup levels and the clean overburden required to be removed to access the underlying saturated zone soils. The clean overburden would be stockpiled nearby for later use as backfill, and the soil exceeding the cleanup levels would be segregated by

contaminant level and taken to the appropriate stockpile and/or treatment area for processing as defined below.

Next, the saturated zone would be excavated as described above for Alternative 3, with dewatering activities used as necessary and the groundwater generated collected and treated onsite using the existing wastewater treatment system prior to discharging to the sanitary sewer under the Facility's existing permit. The excavated saturated soils will be segregated by contaminant level and taken to the appropriate stockpile, dried as necessary prior to reuse or treatment, and then managed as defined below.

As with Alternative 3, the "tool box" of *ex situ* soil treatment technologies will be used to manage the excavated soil. Based on the available information and for purposes of developing a cost estimate for this FS it will be assumed that excavated soils would be managed as defined in Alternative 3 with the exception that 50 percent of the 7,000 cy (i.e., 3,500 cy) of soil being excavated in the Fabrication Building to remove the areas where groundwater exceeds cleanup levels (but soil concentrations are below cleanup levels), would have soil concentrations below residential cleanup levels and can be used as fill without additional treatment beyond drying. Due to the presence of a thin layer of petroleum product noted near the water table near boring TB12, the other 50 percent of this soil is assumed to have concentrations exceeding commercial standards and will require treatment prior to use as fill. With these assumptions, the excavated soil in Alternative 4 would be managed as follows:

- Approximately 4,100 cy (49 percent) would have contaminant levels below commercial cleanup levels and can be used directly as fill in the commercially-zoned areas (after drying if necessary);
- Approximately 2,400 cy of the soil (28 percent), generally those with low to moderate contaminant levels, would be treated directly using biopiling techniques to at least commercial cleanup levels and used as fill in the commercially-zoned areas;
- Approximately 1,400 cy of the soils (17 percent), generally those with the highest contaminant levels, would be treated using low temperature thermal desorption; and
- Approximately 500 cy of the soils (6 percent) would require off-site disposal.

Once the excavation is completed, it would be backfilled using a combination of recycled concrete (generated during demolition of the current building foundations) and imported granular fill to the approximate elevation of the water table and then using clean overburden, clean imported fill, or potentially soils treated to below the residential cleanup levels. In order to prevent the recontamination of the clean backfill in the saturated zone, amendments may be added to the backfill to promote enhanced biodegradation of contaminants in groundwater that flow back into the former excavation.

As described above for Alternative 3, verification soil and soil gas samples would be collected to evaluate whether the target cleanup levels have been met. Should verification results indicate that the cleanup level has not been attained, additional excavation would be performed.

**Excavation and Off-site Disposal of Metals-Impacted Soil.** As noted previously, the only area where metals concentrations exceed cleanup levels in soil is the near-surface soil around boring DESS1 adjacent to the former Double-Ender Building (see Plate 19). Assuming that the full 4-ft-thick unsaturated zone contains metals above the cleanup levels, this area includes approximately 590 cy of soil. This soil will be excavated and transported off-site to a secure, licensed landfill for disposal.

### 9.5.2 Cost

The estimated costs associated with implementing Alternative 4 are shown in Table 38. The capital costs for Alternative 4 would include excavation and treatment of TPH-contaminated soils and groundwater, placing treated soil as fill, amending the backfill to promote biodegradation of residual contaminants, managing groundwater generated during dewatering, and excavation and off-site treatment of metals-contaminated soils. There are no ongoing O&M costs associated with Alternative 4.

The estimated capital costs (and total remediation costs since there are no O&M costs) for Alternative 4 range from a low of \$720,000 to a high of \$1.28 million, with an average capital cost of \$1.0 million. It is assumed that implementation of Alternative 4 would be conducted in 2008 and that all capital costs will be incurred during 2008, although some *ex situ* soil treatment activities could extend into 2009.

## 10.0 EVALUATION OF REMEDIAL ALTERNATIVES

The following section: (1) summarizes the criteria for evaluation of remedial alternatives; (2) evaluates the four remedial alternatives against the evaluation criteria and RAOs; (3) presents a comparative evaluation of the four alternatives against each other with respect to the evaluation criteria and RAOs; and (4) recommends a preferred remedial alternative for implementation to address soil and groundwater contamination at the Site.

### 10.1 Criteria for Evaluation

In addition to the RAOs developed in Section 7.4, each remedial alternative will be evaluated against the nine evaluation criteria set forth in the NCP and accompanying USEPA guidance documents (NCP, 1990 and USEPA, 1998). These nine criteria are divided into three categories: “Threshold Criteria,” “Primary Balancing Criteria,” and “Modifying Criteria.”

In accordance with USEPA guidance in the NCP, the selected alternative is required to meet the two threshold criteria. The five primary balancing criteria provide comparisons between



the alternatives and identify tradeoffs between them. The two modifying criteria consider acceptance by the State and by the local community. The nine evaluation criteria are described below.

#### 10.1.1 Threshold Criteria

- **Overall Protection of Human Health and the Environment.** This criterion addresses whether a remedial alternative is protective of human health and the environment considering long-term and short-term site-specific characteristics. The remedy's short-term effectiveness, long-term effectiveness and permanence, and ability to reduce chemical toxicity, mobility, and volume affect the evaluation under this criterion. This criterion considers the degree of certainty that an alternative can meet the site-specific remedial action goals; and
- **Compliance with Applicable or Relevant and Appropriate Requirements.** RAOs for the site are developed by considering, among other things, ARARs. The remedial alternatives must comply with ARARs, which are presented in Section 7.2.

#### 10.1.2 Balancing Criteria

- **Long-Term Effectiveness and Permanence.** This criterion addresses how well a remedy maintains protection of human health and the environment after the site-specific remedial goals have been met to the extent feasible. Components to be addressed include the magnitude of residual risk, the adequacy and long-term reliability of institutional controls and containment systems, and potential consequences should the remedy or some portion of it fail;
- **Reduction of Mobility, Toxicity, or Volume.** Under this criterion, the anticipated amount of the chemical of concern destroyed or treated and the amount remaining at the site are assessed, along with the degree of expected reduction in chemical mobility, toxicity, or volume;
- **Short-Term Effectiveness.** This criterion concerns protection of human health and the environment during construction and implementation of the remedy;
- **Implementability.** Implementability considers both the technical and administrative feasibility of implementation. The criterion also considers the ability to construct and operate remedial facilities, ease of undertaking additional remedial actions, ability to monitor remedial effectiveness, and the ability to obtain necessary approvals and permits; and
- **Cost.** The costs to be assessed include the capital cost, annual operation and maintenance costs

### 10.1.3 Modifying Criteria

- **State Acceptance.** The State Acceptance criterion incorporates input from state agencies to modify the alternative selection process. This input can be obtained via formal comments received during the project comment period; and
- **Community Acceptance.** This criterion addresses reaction from the local citizenry.

The NCP requires that an environmental evaluation of sensitive or critical habitats be conducted. For the Other Areas Sites, there are no sensitive or critical habitats requiring environmental evaluation. The primary potential impact from contaminated soil and groundwater at the Site is to future users.

## 10.2 Detailed Evaluation of Alternatives

The evaluation of the remedial alternatives against the NCP criteria and the RAOs is presented in Table 39, and summarized below for each alternative.

### 10.2.1 Alternative 1 – No Action

There are little or no costs associated with Alternative 1.

Alternative 1 does not meet either of the threshold NCP criteria – (1) protection of human health and the environment and (2) compliance with ARARs. It does not meet the RAOs described in Section 7.4. Therefore, Alternative 1 is judged not to be acceptable.

### 10.2.2 Alternative 2 – Groundwater Monitoring

Alternative 2 has an estimated cost (net present value) of \$710,000.

Inasmuch as the NCP mandates consideration of the reasonable range of foreseeable land uses for the Site, Alternative 2 does not meet either of the threshold NCP criteria – (1) protection of human health and the environment and (2) compliance with ARARs. It does not meet the RAOs described in Section 7.4. Therefore, Alternative 2 is judged not to be acceptable.

### 10.2.3 Alternative 3 – *Ex Situ* Source Area Soil and Groundwater Treatment and *In Situ* Groundwater Remediation

Because it reduces contaminant concentrations to below risk-based cleanup levels, Alternative 3 is protective of human health and the environment and meets the first threshold requirement. This alternative is also expected to comply with ARARs. In general, Alternative 3 also compares well on the five balancing criteria, with the possible exception of technical implementability. Specifically, potential difficulties associated with uniformly distributing the chemical oxidant throughout the relatively low permeability soils of the treatment zone would

need to be addressed prior to implementation. Treatability studies can be conducted to help address this issue.

Alternative 3 has an estimated cost of \$880,000, almost all of which are capital costs related to treatment of the soil and groundwater during the first year this alternative is implemented. The major uncertainties associated with this cost are related to unit costs for soil and groundwater treatment. Information developed during treatability studies conducted during design would help refine these unit costs and reduce the cost uncertainty.

#### **10.2.4 Alternative 4 – *Ex Situ* Soil and Groundwater Remediation**

The evaluation of Alternative 4 is very similar to that of Alternative 3, except there are no implementability concerns related to *in situ* chemical oxidation for Alternative 4. This alternative meets all of the NCP criteria with a relatively high degree of certainty.

Alternative 4 has an estimated cost of \$1.0 million, all of which are capital costs related to treatment of the soil and groundwater during the first year this alternative is implemented. As with Alternative 3, the major uncertainties associated with this cost are related to unit costs for soil and groundwater treatment, which can be refined based on treatability studies conducted during design.

### **10.3 Summary of Comparison of Remedial Alternatives**

The comparative evaluation of the alternatives against each of the criteria is also shown in Table 39. Alternatives 1 and 2 compare poorly against the other two alternatives in all criteria (except cost) and, as such, are not acceptable alternatives for meeting the RAOs.

Comparing Alternatives 3 and 4, they are very similar in their ability to meet the cleanup objectives. Both compare favorably to the evaluation criteria, and both meet the RAOs for the Site. These alternatives have similar costs. The only significant difference between the two alternatives is related to the *in situ* chemical oxidation component of Alternative 3. As described in Table 39, given the relatively low permeability and potentially stratified nature of the soils in the saturated zone, there may be some difficulties in effectively distributing the chemical oxidant throughout the treatment zone. Uniform distribution of treatment chemicals is critical to effectively treat the entire affected area. Failure to uniformly distribute the oxidant could lead to partially treated, or even untreated, areas that could lead to a “rebound” effect for contaminant levels in groundwater. If post-treatment monitoring indicated that a rebound in concentrations was occurring, supplemental injections of oxidant may be required to polish the residual contaminants and meet cleanup levels.

### **10.4 Recommended Remedial Alternative**

Based on the evaluation of the three alternatives against the NCP criteria and the RAOs, Alternative 4 is superior in terms of long-term effectiveness, permanence, and

implementability. Although Alternative 3 would also likely achieve the cleanup objectives in a timely manner, the higher level of certainty associated with Alternative 4 with only a 15 percent increase in cost compared to Alternative 3 leads to the recommendation of Alternative 4.

## **11.0 REMEDIAL ACTION PLAN IMPLEMENTATION**

This section discusses the conceptual design of the recommended remedial action. A preliminary schedule for remedial action implementation and reporting is also presented.

### **11.1 Conceptual Remedial Design**

Alternative 4 is described in Section 9.5 and generally consists of the excavation of a total of approximately 8,400 cy of saturated and unsaturated soils and groundwater that exceed their respective cleanup levels for TPH compounds. The limited quantity of shallow soil exceeding metals cleanup level near the former Double-Ender Building will be excavated and disposed of off-site at a licensed landfill. The excavated TPH-contaminated soil would be segregated into categories and managed consistent with a soil management protocol. Where treatment is required to achieve cleanup levels prior to use of the soil as fill, technologies in the “tool box” would be utilized. The soil management protocol will be prepared as part of the RDIP and will be a document that presents the detailed protocol for managing all soil excavated not only at the Site, but for remedial actions at Site 2/3, Site 4 and Site 6.

#### **11.1.1 Remediation Procedures and the Soil Management Protocol**

The detailed approach for conducting the excavation at the Site will be developed during design in consultation with potential remediation contractors. In general, the initial excavation would be the unsaturated soils exceeding residential cleanup levels and the clean overburden followed by the saturated zone. Groundwater generated during required dewatering activities will be collected and treated onsite using the existing wastewater treatment system prior to discharging to the sanitary sewer under the Facility’s existing permit. The overall approach for handling the excavated soil is described above in Section 9.1.3, with the soil being segregated into categories based on contaminant levels and managed consistent with the soil management protocol.

Soil samples would be collected and submitted for chemical analysis to evaluate which category specific soil falls into and therefore how it will be managed. Soil samples to characterize the soil would be collected at a frequency specified in the RDIP. For soils requiring treatment prior to being used as backfill, the technologies retained in the “tool box” for treating soil *ex situ* include biopiling, landfarming, low temperature thermal desorption, and off-site disposal.

Following completion of excavation activities, backfilling would proceed using a combination of recycled concrete and imported granular fill to the approximate elevation of the water table

and then using clean overburden, clean imported fill, or potentially soils treated to below the residential cleanup levels. Note that per the RWQCB, soils proposed for reuse within 5 feet of the ground surface in residential areas must meet the residential nuisance ESLs for TPH (middle distillates) and TPH (residual fuels) of 100 and 500 mg/kg, respectively. Amendments may be added to the backfill to promote enhanced biodegradation of contaminants in groundwater that flows back into the former excavation to prevent the recontamination of the clean backfill in the saturated zone.

### **11.1.2 Permitting and Contractor Health and Safety**

The work will be conducted in accordance with applicable federal, state and local regulations. These include, but are not limited to:

- National Fire Protection Association (NFPA) NFPA 30 Flammable and Combustible Liquids;
- Occupational Safety and Health Administration (OSHA), Title 29 Code of Federal (CFR) 1910.120. Regulations applicable to hazardous waste site operations (HAZWOPER);
- Health and Safety Code Division 20, Chapters 6.5 and 6.8;
- Title 8 California Code of Regulations (CCR) General Industry Safety Orders (GISO) 5192 Hazardous Materials Storage Ordinance, and Title 8 CCR 1532.1;
- Title 22, CCR Sections 66261.2 and 66261.3;
- Napa County Grading and Construction Ordinances;
- Napa Sanitation District Discharge Limitations;
- Napa County Ordinance No. 1240, Stormwater Management and Discharge Control;
- Napa County Code, Section 13.12 (specifies that permits must be obtained prior to drilling and installing certain soil borings and groundwater wells); and
- Bay Area Air Quality Management District (BAAQMD) Rules and Regulations: Organic Compounds, Regulation 8; and Hazardous Pollutants, Regulation 11.

The excavation and soil handling would be conducted by a qualified, HAZWOPER-trained, contractor using conventional earthwork equipment. The contractor would prepare a Site Specific Health and Safety Plan (HSP), which will address identification of hazards, hazard mitigation, safe work practices and emergency response procedures for the project. The site-specific HSP would be prepared to comply with 29 CFR 1910.120 and Title 8 CCR GISO 5192. Additionally, any remediation subcontractors selected to perform remedial work on-Site would be required to prepare a HSP for its activities.

### **11.1.3 Site Preparation**

Prior to conducting the proposed remedial activities, it is assumed that all structures including buildings, foundations and floor slabs, paving, and materials stored or stockpiled in or near the Site would be demolished and/or removed. In addition, it is assumed underground utilities would be removed or abandoned as appropriate.

In addition to removing the structures, foundations, utilities, and existing groundwater monitoring wells in and near the excavation, areas of the Facility that would be utilized to implement the remedial action would be cleared of obstructions and otherwise prepared for use. This would include preparation of equipment lay down and staging areas, soil stockpile areas, soil treatment areas, and areas where treated soil will be used as fill. Because soil stockpiling, soil treatment, and overall site filling would also be conducted at the other areas of the Facility, these activities would be coordinated with the remedial actions proposed for the other sites.

### **11.1.4 Verification Sampling**

Verification soil samples will be collected from the excavation areas using a hand sampler and earthmoving equipment to evaluate whether the cleanup levels have been met. Detailed descriptions of the verification sampling procedures and analytical program will be provided in the Verification Sampling and Analysis Plan (VSAP) that will be included as part of the RDIP. The VSAP will specify the number of sidewall and excavation bottom soil samples that will be collected and the depth intervals where samples are to be collected. Sample locations and the number of samples collected may be adjusted in the field if necessary. Verification sample analyses will likely be performed utilizing an expedited laboratory turn-around schedule, or an on-site mobile laboratory, to reduce the likelihood for significant delays to affect the remedial action schedule.

In addition to verification soil sampling, it is anticipated that soil gas samples will be collected from shallow soil to confirm that residual contamination that may be present at depth, although below their respective soil or groundwater cleanup levels, is not causing an exceedance of a soil gas ESL. Should laboratory analytical results indicate that the cleanup level has not been attained, additional excavation will be performed.

### **11.1.5 Dust and Odor Control**

During shallow excavation activities, depending on soil conditions, there is potential to generate airborne dust. Therefore, as required, the contractor will apply a water mist to the excavation and soil handling and haul routes to reduce the potential for dust generation. Soil will be wetted as needed to reduce the occurrence of visible dust. Air monitoring will be conducted in accordance with local air quality management regulations as described in the RDIP and/or the contractor's HSP.

### **11.1.6 Decontamination**

Equipment used to excavate, transport, and manage the affected soil will be decontaminated prior to leaving the site. The equipment will first be decontaminated by removing visible soil by sweeping or brushing. Soil that cannot be removed by this procedure will be removed from equipment by washing in a prepared decontamination area. The decontamination area will be constructed in a central location that will be utilized for all remediation activities at the site. Decontamination wash water will be collected, characterized, treated on site using the existing wastewater treatment system, and discharged to the sanitary sewer.

### **11.1.7 Excavation Backfilling**

The excavations will be backfilled once verification soil sampling confirms that cleanup levels are met throughout the excavation area. The specific backfill requirements will be determined during remedial design and will incorporate geotechnical considerations for future residential and commercial construction. Procedures and specifications will be included in the RDIP. For portions of the excavation below the water table, backfilling will typically utilize recycled concrete and asphalt in the bottom of the excavations to bridge over the wet, fined-grained soils and then utilize imported granular fill to bring the grade back up to above the water table elevation. Above the water table, backfill will likely consist of clean overburden, other excavated soils where COC concentrations are below the applicable cleanup levels, or treated soil, as appropriate.

## **11.2 Schedule of Remedial Action Implementation and Reporting**

It is anticipated that the soil excavation would be completed during the 2008 construction season, approximately April through October, pending approval of this RI/FS/RAP, preparation of the RDIP, and issuance of the needed permits by the County and associated approvals. Approval of this document does not limit the County's normal environmental review associated with such permit(s) and related approvals. Depending on the total volume of soil requiring treatment from all the remediation areas (e.g., Sites 2/3, 4 and 6), and the specific type of treatment utilized (e.g., biopiling, LTDD), treatment of excavated soils may extend beyond 2008 into 2009.

Treatability studies to develop design information for select technologies would be implemented during 2007. Initiation of these treatability studies is expected in the second quarter of 2007.

## **11.3 Performance Criteria**

Evaluation of the progress of the soil and groundwater remediation program will be conducted throughout its implementation. The laboratory analytical results of the soil verification samples will be compared to the proposed target remedial goals. If these compounds are detected in

verification soil sampling above the proposed target cleanup levels and further excavation is not feasible, PES will consult with RWQCB staff to evaluate the appropriateness of instituting additional remedial measures, if warranted.

#### **11.4 Reporting**

Following completion of remediation activities, a remedial action implementation report will be prepared and submitted to RWQCB for review and approval. The report will summarize the work that was performed, verification soil and soil gas sample analytical results, and document that the cleanup levels have been achieved. Performance monitoring results for soil treatment will be reported and the final disposition of excavated soils will be documented. Copies of laboratory reports and chain-of-custody forms will be included.

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## **TABLES**

Table 1  
Environmental Screening Levels  
Napa Pipe Facility  
Napa, California

SOIL					GROUNDWATER	
Nondrinking Water Resource					Nondrinking Water Resource	
	ESL	ESL	ESL	ESL		ESL
	Shallow Soil (<3m)	Shallow Soil (<3m)	Deep Soil (>3m)	Deep Soil (>3m)		
Parameter	Residential	Commercial	Residential	Commercial	Parameter	(µg/l)
(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		
TPH (gasoline)	100	500 <sup>0</sup>	5000 <sup>3</sup>	5000 <sup>3</sup>	TPH (gasoline)	5000 <sup>8,11</sup>
TPH (middle distillates)	100/400 <sup>1</sup>	500/750 <sup>2</sup>	5000 <sup>3</sup>	5000 <sup>3</sup>	TPH (middle distillates)	2500 <sup>8,11</sup>
TPH (residual fuels)	500/1000 <sup>4</sup>	2500 <sup>5</sup>	5000 <sup>6</sup>	5000 <sup>7</sup>	TPH (residual fuels)	2500 <sup>8</sup>
Benzene	0.18	0.38	0.18	0.51	Benzene	540 <sup>9</sup>
Naphthalene	0.46	1.5	0.46	1.5	Naphthalene	210 <sup>10</sup>
TCE	0.26	0.73	0.26	0.73	TCE	530 <sup>9</sup>
1,1-DCE	8.9 <sup>12</sup>	2.1 <sup>12</sup>	8.9 <sup>12</sup>	21	1,1-DCE	6300 <sup>9</sup>
cis-1,2-DCE	1.6	3.6	1.6	3.6	cis-1,2-DCE	6200 <sup>9</sup>
Chloroethane	0.63	0.85	0.63	0.85	Chloroethane	160 <sup>10</sup>
1,1-DCA	0.32	0.89	0.32	0.89	1,1-DCA	1000 <sup>9</sup>
Vinyl Chloride	0.0067	0.019	0.0067	0.019	Vinyl Chloride	3.8
trans-1,2-DCE	3.1	7.3	3.1	7.3	trans-1,2-DCE	2600 <sup>10</sup>
1,2-DCA	0.025	0.07	0.025	0.07	1,2-DCA	200
PCE	0.087	0.24	0.087	0.24	PCE	120 <sup>9</sup>
1,1,1-TCA	98 <sup>12</sup>	230 <sup>12</sup>	98 <sup>12</sup>	230 <sup>12</sup>	1,1,1-TCA	50000 <sup>10</sup>
1,1,2-TCA	0.032	0.089	0.032	0.089	1,1,2-TCA	350
Styrene	450 <sup>12</sup>	1000 <sup>14</sup>	450 <sup>12</sup>	1100 <sup>12</sup>	Styrene	110 <sup>10</sup>
Methylene Chloride	0.52	1.5	0.52	1.5	Methylene Chloride	2400 <sup>9</sup>
1,2-Dichlorobenzene	8.9 <sup>12</sup>	21 <sup>12</sup>	8.9 <sup>12</sup>	21 <sup>12</sup>	1,2-Dichlorobenzene	100 <sup>10</sup>
1,4-Dichlorobenzene	0.046	0.13	0.046	0.13	1,4-Dichlorobenzene	110 <sup>10</sup>
Chlorobenzene	2.7 <sup>12</sup>	6.2 <sup>12</sup>	2.7 <sup>12</sup>	6.2 <sup>12</sup>	Chlorobenzene	500 <sup>10</sup>
Bromodichloromethane	0.014	0.039	0.014	0.039	Bromodichloromethane	170
Chloroform	0.88	1.9	78 <sup>13</sup>	78 <sup>13</sup>	Chloroform	330
Dibromochloromethane	0.019	0.054	0.019	0.054	Dibromochloromethane	170
Bromomethane	0.22	0.51	0.22	0.51	Bromomethane	580 <sup>9</sup>
MTBE	2	5.6	2	5.6	MTBE	1800
Ethylbenzene	390 <sup>12</sup>	390 <sup>12</sup>	390 <sup>12</sup>	390 <sup>12</sup>	Ethylbenzene	300 <sup>10</sup>
Xylenes	310 <sup>12</sup>	420 <sup>12</sup>	310 <sup>12</sup>	420 <sup>12</sup>	Xylenes	5300 <sup>10</sup>
Toluene	100 <sup>13</sup>	310 <sup>12</sup>	130 <sup>12</sup>	310 <sup>12</sup>	Toluene	400 <sup>10</sup>
2-Butanone	490 <sup>12</sup>	1000 <sup>14</sup>	490 <sup>12</sup>	1300 <sup>12</sup>	2-Butanone	50000 <sup>10</sup>
Acetone	500 <sup>14</sup>	1000 <sup>14</sup>	1000 <sup>14</sup>	2500 <sup>14</sup>	Acetone	50000 <sup>10</sup>
1,4-Dioxane	18	30	30	30	1,4-Dioxane	50000
Anthracene	6.1 <sup>15</sup>	6.1 <sup>15</sup>	6.1 <sup>15</sup>	6.1 <sup>15</sup>	Anthracene	22 <sup>10</sup>
Fluorene	160 <sup>15</sup>	160 <sup>15</sup>	160 <sup>15</sup>	160 <sup>15</sup>	Fluorene	950 <sup>10</sup>
Methylnaphthalene (total 1- & 2-)	110 <sup>15</sup>	110 <sup>15</sup>	110 <sup>15</sup>	110 <sup>15</sup>	Methylnaphthalene (total 1- & 2-)	100 <sup>10</sup>
Phenanthrene	40 <sup>16</sup>	40 <sup>16</sup>	1000 <sup>17</sup>	2500 <sup>17</sup>	Phenanthrene	410 <sup>10</sup>
Bis(2-ethylhexyl)Phthalate	160	570 <sup>13</sup>	1000 <sup>17</sup>	2500 <sup>17</sup>	Bis(2-ethylhexyl)Phthalate	650 <sup>10</sup>
Chrysene	3.8	13	150 <sup>13</sup>	150 <sup>13</sup>	Chrysene	0.8 <sup>10</sup>
Fluoranthene	40	390 <sup>15</sup>	1000 <sup>17</sup>	2500 <sup>17</sup>	Fluoranthene	130 <sup>10</sup>
Pyrene	85	85 <sup>15</sup>	85 <sup>15</sup>	85 <sup>15</sup>	Pyrene	68 <sup>10</sup>

Table 1  
Environmental Screening Levels  
Napa Pipe Facility  
Napa, California

SOIL Nondrinking Water Resource					GROUNDWATER Nondrinking Water Resource	
Parameter	ESL Shallow Soil (<3m) Residential (mg/kg)	ESL Shallow Soil (<3m) Commercial (mg/kg)	ESL Deep Soil (>3m) Residential (mg/kg)	ESL Deep Soil (>3m) Commercial (mg/kg)	Parameter	ESL (µg/l)
Antimony	6.1	40	280	280	Antimony	50000 <sup>10</sup>
Arsenic	5.5	5.5	5.5	5.5	Arsenic	50000 <sup>10</sup>
Barium	750	1500	2500	2500	Barium	50000 <sup>10</sup>
Beryllium	4	8	36	36	Beryllium	50000 <sup>10</sup>
Cadmium	1.7	7.4	38	38	Cadmium	50000 <sup>10</sup>
Chromium	58	58	58	58	Chromium	50000 <sup>10</sup>
Chromium VI	1.8	1.8	1.8	1.8	Chromium VI	50000 <sup>10</sup>
Cobalt	10	10	10	10	Cobalt	50000 <sup>10</sup>
Copper	230	230	2500	5000	Copper	50000 <sup>10</sup>
Lead	150	750	750	750	Lead	50000 <sup>10</sup>
Molybdenum	40	40	2500	3600	Molybdenum	50000 <sup>10</sup>
Mercury	3.7	10	98	98	Mercury	50000 <sup>10</sup>
Nickel	150	150	1000	1000	Nickel	50000 <sup>10</sup>
Selenium	10	10	2500	3400	Selenium	50000 <sup>10</sup>
Silver	20	40	2500	3600	Silver	50000 <sup>10</sup>
Thallium	1	13	47	47	Thallium	50000 <sup>10</sup>
Vanadium	110	200	2500	5000	Vanadium	50000 <sup>10</sup>
Zinc	600	600	2500	5000	Zinc	50000 <sup>10</sup>

Notes:

- ESL = Environmental Screening Level (RWQCB, February 2005)  
TPH (middle distillates) includes TPH as diesel  
TPH (residual fuels) includes TPH as motor oil and TPH as hydraulic oil  
0 = The final ESL from Table B-2 (commercial/industrial) of RWQCB, 2005 is 400 mg/kg, based on protection of surface water resources via soil leaching to groundwater and discharge of groundwater to surface water, Table G.  
This pathway does not apply and the cleanup value defaults to 500 mg/kg (gross contamination ceiling value) and with the recognition that confirmation soil gas testing may be required.  
1 = The final ESL from Table B-1 of RWQCB, 2005 is 100 mg/kg, based on the Gross Contamination Ceiling Value (Odors, etc.), Table H-2. However, the MADEP screening values, (Appendix 7, RWQCB, 2005) on which Table H-2 is based, state that the nuisance ceiling value for C9 to C18 carbon range (equivalent to the lighter fraction of diesel is 1000 mg/kg (not 100 mg/kg). This value is higher than the next lowest value of 400 mg/kg (direct exposure) shown on Table B-1.  
For the shallowest soils (0-3 ft. bgs) the lower of the two values (100 mg/kg) is selected to conservatively protect for nuisance odor issues. For deeper soils (>3 ft bgs but <3 m), the proposed cleanup value is 400 mg/kg.  
2 = The final ESL from Table B-2 of RWQCB, 2005 is 500 mg/kg, based on both the gross contamination ceiling value (odors, etc.) from Table H-2 and protection of surface water resources via soil leaching to groundwater and discharge of groundwater to surface water, Table G. Note that the 500 mg/kg value for soil from Table G is already a non-drinking water number and is based on soil leaching protective of surface water discharge at 640 µg/l. This pathway would likely not apply  
In addition, similar to footnote 1, the MADEP screening levels are listed as 1,000 mg/kg, not 500 mg/kg. The next highest value on Table B-2 is the direct contact value of 750 mg/kg.  
For the shallowest soils (0-3 ft. bgs) the lower of the two values (500 mg/kg) is selected to conservatively protect for nuisance odor issues. For deeper soils (>3 ft bgs but <3 m), the proposed cleanup value is 750 mg/kg. It also recognized that confirmation soil gas testing may be required.  
3 = The final ESL from Table D-1 (residential) and Table D-2 (commercial/industrial) of RWQCB, 2005 is 400 for TPH(gasolines) and 500 mg/kg for TPH(middle distillates), based on protection of surface water resources via soil leaching to groundwater and discharge of groundwater to surface water, Table G. This pathway does not apply and the cleanup value defaults to 5000 mg/kg (gross contamination ceiling value) and with the recognition that confirmation soil gas testing may be required.  
4 = The final ESL from Table B-1 of RWQCB, 2005 is 500 mg/kg, based on the Gross Contamination Ceiling Value, Table H-2. However, the MADEP screening values, (Appendix 7, RWQCB, 2005) on which Table H-2 is based, states that the nuisance ceiling value for C19 to C36 carbon range (equivalent to motor oil and hydraulic oil) is 2500 mg/kg. This value is higher than the next lowest value of 1,000 (direct exposure) shown on Table B-1  
As in footnotes 1 and 2, the lower value (in this case 500 mg/kg) is retained to conservatively protect for nuisance odor issues in the shallowest soils (0-3 ft bgs). For the deeper soils (>3 ft and <3m), the direct exposure number (1,000 mg/kg) is  
5 = The final ESL from Table B-2 of RWQCB, 2005 is 1000 mg/kg, based on the Groundwater Protection (Soil Leaching), Non-Drinking Water Resource, Table G. However, the value listed follows the LARWQCB guidance, which is based on the protection of a drinking water resource. Shallow groundwater is not a drinking water resource; the drinking water resource is over 150 feet below ground surface. At this depth, the LARWQCB's soil screening level would be 50,000 mg/kg (see Table 4-1 of LARWQCB, 1996). This value is higher than the next lowest value of 2,500 mg/kg, based on the nuisance ceiling as shown on Table B-2; therefore the proposed cleanup goal defaults to 2500 mg/kg  
6 = The final ESL from Table D-1 of RWQCB, 2005 is 1000 mg/kg, based the Groundwater Protection (Soil Leaching), Non-Drinking Water Resource, Table G. However, the value listed follows the LARWQCB guidance (see footnote on Table D-1 and Section 5.3.2 text of RWQCB, 2005), which is based on the protection of a drinking water resource. Shallow groundwater is not a drinking water resource; the drinking water resource is over 150 feet below ground surface. At this depth, the LARWQCB soil screening level would be 50,000 mg/kg (see Table 4-1 of LARWQCB, 1996). This value is higher than the next lowest value of 5000 (gross contamination ceiling value) shown on Table D-1; therefore the proposed cleanup goal defaults to 5000 mg/kg  
7 = The final ESL from Table D-2 of RWQCB, 2005 is 1000 mg/kg, based the Groundwater Protection (Soil Leaching), Non-Drinking Water Resource, Table G. However, the value listed follows the LARWQCB's guidance (see footnote on Table D-1 and Section 5.3.2 text of RWQCB, 2005), which is based on the protection of a drinking water resource. Shallow groundwater is not a drinking water resource; the drinking water resource is over 150 feet below ground surface. At this depth, the LARWQCB soil screening level would be 50,000 mg/kg (see Table 4-1 of LARWQCB, 1996). This value is higher than the next lowest value of 5000 (gross contamination) shown on Table D-2; therefore the proposed cleanup goal defaults to 5000 mg/kg  
8 = No aquatic habitat pathway. Defaults to gross contamination ceiling level value.  
9 = No aquatic habitat pathway. Defaults to vapor intrusion pathway.  
10 = No aquatic habitat pathway. Defaults to gross contamination ceiling value.  
11 = Soil gas values to be used for verifying cleanup.  
12 = Protection of surface water resources via soil leaching to groundwater and discharge of groundwater to surface water does not apply; therefore, the cleanup value defaults to the vapor intrusion pathway  
13 = Protection of surface water resources via soil leaching to groundwater and discharge of groundwater to surface water does not apply; therefore, the cleanup value defaults to the direct exposure pathway.  
14 = Protection of surface water resources via soil leaching to groundwater and discharge of groundwater to surface water does not apply; therefore, the cleanup value defaults to the gross contamination ceiling value.  
15 = The final ESLs from Tables B-1 and D-1 (residential) and Tables B-2 and D-2 (Commercial/Industrial) of RWQCB, 2005 are based on protection of surface water resources via soil leaching to groundwater and discharge of groundwater to surface water, Table G  
This pathway does not apply and the cleanup value defaults to the vapor intrusion into buildings pathway  
16 = The final ESLs from Tables B-1 and D-1 (residential) and Tables B-2 and D-2 (Commercial/Industrial) of RWQCB, 2005 are based on protection of surface water resources via soil leaching to groundwater and discharge of groundwater to surface water, Table G  
This pathway does not apply and the cleanup value defaults to the Urban Area Ecotoxicity Criteria  
17 = The final ESLs from Tables D-1 (residential) and D-2 (Commercial/Industrial) of RWQCB, 2005 are based on protection of surface water resources via soil leaching to groundwater and discharge of groundwater to surface water, Table G.  
This pathway does not apply and the cleanup value defaults to the Gross Contamination Ceiling Value

**Table 2**  
**Summary of Analyses Performed on Soil and Groundwater Samples**  
**Other Areas Sites (Fabrication Buildings Area, Former Acid Drain Line,**  
**Former Internal Coating Building, and Former Double-Ender Building)**  
**Napa Pipe Facility**  
**Napa, California**

Location	Soil Analyses					Groundwater Analyses					Comments
	TPH-d/mo	VOCs	CAM 17 Metals <sup>1</sup>	Hexavalent Chromium	pH	TPH-d/mo	VOCs	CAM 17 Metals <sup>1</sup>	Hexavalent Chromium	pH	
Fabrication Buildings Area											
TB4	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2 and 7 feet bgs
TB5	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2 and 5 feet bgs
TB6	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 6 feet bgs
TB7	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 6 feet bgs
TB8	X	X	X	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 6.5 feet bgs
TB9	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2 and 6 feet bgs
TB10	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 1.75 and 5.5 feet bgs
TB11	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2 and 6 feet bgs
TB12	X	X	X	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2 and 7 feet bgs
TB13	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
TB14	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
TB15	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 6.5 feet bgs
TB16	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 6.5 feet bgs
TB17	X	X	X	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
TB22	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 6.5 feet bgs
TB23	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 7 feet bgs
TB26	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 6 feet bgs
TB27	X	X	X	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 5.5 feet bgs
TB28	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 7 feet bgs
TB29	X	X	X	X	NR	X	X	X	X	NR	Soil samples collected at 2.5 and 5.5 feet bgs
TB30	X	X	X	X	NR	X	X	X	X	NR	Soil samples collected at 2.5 and 7 feet bgs
TB31	X	X	X	X	NR	X	X	X	X	NR	Soil samples collected at 3 and 7 feet bgs
TB32	X	X	NR	NR	NR	X	X	X	X	NR	Soil samples collected at 2.5 and 6.5 feet bgs
TB33	X	X	NR	NR	NR	X	X	X	X	NR	Soil samples collected at 3 and 6 feet bgs
TB34	X	X	NR	NR	NR	X	X	X	X	NR	Soil samples collected at 2.5 and 7 feet bgs
TB35	X	X	NR	NR	NR	X	X	X	X	NR	Soil samples collected at 2 and 6.5 feet bgs
TB36	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2 and 7 feet bgs
TB37	X	X	X	X	NR	X	X	X	X	NR	Soil samples collected at 2.5 and 7 feet bgs
TB38	X	X	X	X	NR	X	X	X	X	NR	Soil samples collected at 3 and 5.5 feet bgs

**Table 2**  
**Summary of Analyses Performed on Soil and Groundwater Samples**  
**Other Areas Sites (Fabrication Buildings Area, Former Acid Drain Line,**  
**Former Internal Coating Building, and Former Double-Ender Building)**  
**Napa Pipe Facility**  
**Napa, California**

Location	Soil Analyses					Groundwater Analyses					Comments
	TPH-d/mo	VOCs	CAM 17 Metals <sup>1</sup>	Hexavalent Chromium	pH	TPH-d/mo	VOCs	CAM 17 Metals <sup>1</sup>	Hexavalent Chromium	pH	
TB39	X	X	X	X	NR	X	X	X	X	NR	Soil samples collected at 2 and 7 feet bgs
TB40	X	X	NR	NR	NR	X	X	X	X	NR	Soil samples collected at 2.5 and 6 feet bgs
TB41	X	X	NR	NR	NR	X	X	X	X	NR	Soil samples collected at 2.5 and 7 feet bgs
TB42	X	X	NR	NR	NR	X	X	X	X	NR	Soil samples collected at 1.5 and 7 feet bgs
TB43	X	X	NR	NR	NR	X	X	X	X	NR	Soil samples collected at 3 and 6.75 feet bgs
TB44	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 6.5 feet bgs
TB45	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2 and 7 feet bgs
TB46	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2 and 7 feet bgs
TB47	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
TB53	X	NR	NR	NR	NR	X	NR	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
TB54	X	NR	NR	NR	NR	X	NR	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
TB56	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 7 feet bgs
TB57	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3, 6.5, and 11.5 feet bgs
TB58	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
TB59	X	X	NR	X	NR	X	X	X	X	NR	Soil samples collected at 3 and 7 feet bgs
TB60	X	X	X	X	NR	X	X	X	X	NR	Soil samples collected at 2.5 and 6.5 feet bgs
TB61	X	NR	NR	NR	NR	X	NR	NR	NR	NR	Soil samples collected at 2.5 and 7 feet bgs
TB62	NR	NR	X	X	X	NR	NR	X	X	X	Soil samples collected at 2, 6, and 9 feet bgs
TB63	X	X	X	X	X	X	X	X	X	X	Soil samples collected at 3, 6, and 9 feet bgs
TB64	X	X	X	X	X	X	X	X	X	X	Soil samples collected at 2, 6, and 9 feet bgs
TB65	X	NR	NR	NR	NR	X	NR	NR	NR	NR	Soil samples collected at 2.5 and 7 feet bgs
TB66	X	NR	NR	NR	NR	X	NR	NR	NR	NR	Soil samples collected at 2 and 7 feet bgs
<b>Former Double-Ender Building</b>											
DE1	X	X	X	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
DE2	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 6.5 feet bgs
DE3	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 7 feet bgs
DE4	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 7 feet bgs
DE5	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 7 feet bgs
DE6	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
DE7	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 6.5 feet bgs

**Table 2**  
**Summary of Analyses Performed on Soil and Groundwater Samples**  
**Other Areas Sites (Fabrication Buildings Area, Former Acid Drain Line,**  
**Former Internal Coating Building, and Former Double-Ender Building)**  
**Napa Pipe Facility**  
**Napa, California**

Location	Soil Analyses					Groundwater Analyses					Comments
	TPH-d/mo	VOCs	CAM 17 Metals <sup>1</sup>	Hexavalent Chromium	pH	TPH-d/mo	VOCs	CAM 17 Metals <sup>1</sup>	Hexavalent Chromium	pH	
DE8	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
DE9	X	X	X	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 6.5 feet bgs
DE10	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 7 feet bgs
DESS1	NR	NR	X	NR	NR	NR	NR	NR	NR	NR	Soil sample collected at 0.5 feet bgs
DESS2	NR	NR	X	NR	NR	NR	NR	NR	NR	NR	Soil sample collected at 0.5 feet bgs
DESS3	NR	NR	X	NR	NR	NR	NR	NR	NR	NR	Soil sample collected at 0.5 feet bgs
DESS4	NR	NR	X	NR	NR	NR	NR	NR	NR	NR	Soil sample collected at 0.5 feet bgs
<b>Former Internal Coating Building</b>											
IC1	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 6.5 feet bgs
IC2	X	X	X	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 6.5 feet bgs
IC3	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
IC4	X	X	X	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
IC5	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
IC6	X	X	NR	NR	NR	X	X	NR	NR	NR	Soil samples collected at 2.5 and 7 feet bgs
IC7	X	X	X	NR	NR	X	X	NR	NR	NR	Soil samples collected at 3 and 7 feet bgs
<b>Former Acid Drain Line</b>											
ADL1	X	X	X	X	NR	X	X	X	X	X	Soil samples collected at 2.5 and 6.5 feet bgs
ADL2	X	X	X	X	NR	X	X	X	X	X	Soil samples collected at 2.5 and 6.5 feet bgs
ADL3	X	X	X	X	NR	X	X	X	X	X	Soil samples collected at 3 and 7 feet bgs
ADL4	NR	NR	NR	NR	NR	X	NR	NR	NR	X	Groundwater only
ADL5	NR	NR	NR	NR	NR	X	NR	NR	NR	X	Groundwater only
ADL6	NR	NR	NR	NR	NR	X	NR	NR	NR	X	Groundwater only

**Notes:**

<sup>1</sup> = Also referred to as California Code of Regulations [CCR] Title 22 metals

bgs = below ground surface

TPH-d/mo = Total petroleum hydrocarbons (TPH) as diesel/TPH as motor oil

VOCs = Volatile organic compounds

NR = Not requested

X = Analysis performed on sample



**Table 3**  
**TPH as Diesel and TPH as Motor Oil in Soil**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	TPH as Diesel (mg/kg)		TPH as Motor Oil (mg/kg)	
TB4	TB4-2'	2-2.5	9/20/2006	1.1	HY	9.4	
	TB4-7'	7-7.5	9/20/2006	ND(1)		ND(5)	
TB5	TB5-2'	2-2.5	9/20/2006	6.6	HY	35	H
	TB5-5.5'	5.5-6	9/20/2006	510	H	550	L
TB6	TB6-2.5'	2.5-3	9/20/2006	1.2	HY	ND(5)	
	TB6-6'	6-6.5	9/20/2006	ND(1)		ND(5)	
TB7	TB7-2.5'	2.5-3	9/20/2006	1.4	HY	7.7	
	TB7-6.5'	6.5-7	9/20/2006	ND(1)		ND(5)	
TB8	TB8-3'	3-3.5	9/20/2006	5.2	HY	24	
	TB8-6.5'	6.5-7	9/20/2006	ND(1)		ND(5)	
TB9	TB9-2'	2-2.5	9/20/2006	1.9	HY	8.1	H
	TB9-6'	6-6.5	9/20/2006	ND(1)		ND(5)	
TB10	TB10-1.75'	1.75-2.25	9/20/2006	ND(1)		ND(5)	
	TB10-5.5'	5.5-6	9/20/2006	ND(1)		ND(5)	
TB11	TB11-2'	2-2.5	9/20/2006	ND(1)		ND(5)	
	TB11-6'	6-6.5	9/20/2006	ND(1)		ND(5)	
TB12	TB12-2'	2-2.5	9/20/2006	ND(1)		ND(5)	
	TB12-7'	7-7.5	9/20/2006	ND(1)		ND(5)	
TB13	TB13-3'	3-3.5	9/20/2006	ND(0.99)		ND(5)	
	TB13-7'	7-7.5	9/20/2006	1.4	HY	ND(5)	
TB14	TB14-3'	3-3.5	9/25/2006	7.1	HY	43	
	TB14-7'	7-7.5	9/25/2006	ND(1)		ND(5)	
TB15	TB15-2.5'	2.5-3	9/21/2006	ND(1)		ND(5)	
	TB15-6.5'	6.5-7	9/21/2006	ND(1)		ND(5)	
TB16	TB16-3'	3-3.5	9/21/2006	ND(1)		ND(5)	
	TB16-6.5'	6.5-7	9/21/2006	ND(1)		ND(5)	
TB17	TB17-3'	3-3.5	9/21/2006	1.3	HY	8.1	
	TB17-7'	7-7.5	9/21/2006	1.1	YZ	ND(5)	
TB22	TB22-2.5'	2.5-3	9/21/2006	430	H	880	HL
	TB22-6.5'	6.5-7	9/21/2006	ND(1)		ND(5)	
TB23	TB23-2.5'	2.5-3	9/26/2006	2.3	HY	12	
	TB23-7'	7-7.5	9/26/2006	1.6	HY	ND(5)	
TB26	TB26-3'	3-3.5	9/22/2006	2.3	HY	7.3	H
	TB26-6'	6-6.5	9/22/2006	ND(1)		ND(5)	
TB27	TB27-3'	3-3.5	9/22/2006	ND(1)		ND(5)	
	TB27-5.5'	5.5-6	9/22/2006	ND(1)		ND(5)	
TB28	TB28-2.5'	2.5-3	9/22/2006	ND(1)		5.0	HY
	TB28-7'	7-7.5	9/22/2006	ND(1)		ND(5)	
TB29	TB29-2.5'	2.5-3	9/25/2006	ND(1)		ND(5)	
	TB29-5.5'	5.5-6	9/25/2006	ND(1)		ND(5)	

**Table 3**  
**TPH as Diesel and TPH as Motor Oil in Soil**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	TPH as Diesel (mg/kg)		TPH as Motor Oil (mg/kg)	
TB30	TB30-2.5'	2.5-3	9/25/2006	1.0	HY	6.2	
	TB30-7'	7-7.5	9/25/2006	ND(1)		ND(5)	
TB31	TB31-3'	3-3.5	9/25/2006	ND(1)		ND(5)	
	TB31-7'	7-7.5	9/25/2006	ND(1)		ND(5)	
TB32	TB32-2.5'	2.5-3	9/26/2006	46	HY	200	
	TB32-6.5'	6.5-7	9/26/2006	1.1	HY	ND(5)	
TB33	TB33-3'	3-3.5	9/25/2006	ND(1)		ND(5)	
	TB33-6'	6-6.5	9/25/2006	ND(1)		ND(5)	
TB34	TB34-2.5'	2.5-3	9/26/2006	3.3	HY	15	
	TB34-7'	7-7.5	9/26/2006	ND(0.99)		ND(5)	
TB35	TB35-2'	2-2.5	9/26/2006	ND(1)		ND(5)	
	TB35-6.5'	6.5-7	9/26/2006	ND(0.99)		ND(5)	
TB36	TB36-2'	2-2.5	9/26/2006	2.5	HY	18	
	TB36-7'	7-7.5	9/26/2006	ND(1)		ND(5)	
TB37	TB37-2.5'	2.5-3	9/26/2006	1.5	HY	8.0	
	TB37-7'	7-7.5	9/26/2006	1.9	HY	ND(5)	
TB38	TB38-3'	3-3.5	9/27/2006	15	Y	15	
	TB38-5.5'	5.5-6	9/27/2006	5.2	Y	13	Y
TB39	TB39-2'	2-2.5	9/26/2006	5.0	Y	11	Y
	TB39-7'	7-7.5	9/26/2006	ND(1)		ND(5)	
TB40	TB40-2.5'	2.5-3	9/27/2006	ND(1)		ND(5)	
	TB40-6'	6-6.5	9/27/2006	ND(1)		ND(5)	
TB41	TB41-2.5'	2.5-3	9/27/2006	ND(1)		ND(5)	
	TB41-7'	7-7.5	9/27/2006	1.1	Y	12	
TB42	TB42-1.5'	1.5-2	9/27/2006	32	Y	350	H
	TB42-7'	7-7.5	9/27/2006	ND(1)		ND(5)	
TB43	TB43-3'	3-3.5	9/28/2006	9.3	Y	37	
	TB43-6.75'	6.75-7.25	9/28/2006	ND(1)		ND(5)	
TB44	TB44-2.5'	2.5-3	9/28/2006	22	Y	180	H
	TB44-6.5'	6.5-7	9/28/2006	ND(1)		ND(5)	
TB45	TB45-2'	2-2.5	9/28/2006	6.8	Y	33	H
	TB45-7'	7-7.5	9/28/2006	1.2	Y	ND(5)	
TB46	TB46-2'	2-2.5	9/28/2006	2.5	Y	11	
	TB46-7'	7-7.5	9/28/2006	ND(1)		ND(5)	
TB47	TB47-3'	3-3.5	9/28/2006	1.3	Y	ND(5)	
	TB47-7'	7-7.5	9/28/2006	1.2	Y	ND(5)	
TB53	TB53-3'	3-3.5	11/1/2006	2.0	HY	7.2	Y
	TB53-7'	7-7.5	11/1/2006	ND(1)		ND(5)	
TB54	TB54-3'	3-3.5	11/1/2006	1.9	HY	16	H
	TB54-7'	7-7.5	11/1/2006	2.0	HY	7.8	HY

**Table 3**  
**TPH as Diesel and TPH as Motor Oil in Soil**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	TPH as Diesel (mg/kg)		TPH as Motor Oil (mg/kg)	
TB56	TB56-2.5'	2.5-3	11/20/2006	ND(1)		ND(5)	
	TB56-7'	7-7.5	11/20/2006	1.4	YZ	ND(5)	
TB57	TB57-3'	3-3.5	11/20/2006	ND(1)		ND(5)	
	TB57-6.5'	6.5-7	11/20/2006	1,300		66	LY
	TB57-11.5'	11.5-12	11/20/2006	16		ND(5)	
TB58	TB58-3'	3-3.5	11/20/2006	1.2	Y	ND(5)	
	TB58-7'	7-7.5	11/20/2006	1.3	Y	ND(5)	
TB59	TB59-3'	3-3.5	11/20/2006	ND(1)		ND(5)	
	TB59-7'	7-7.5	11/20/2006	ND(1)		ND(5)	
TB60	TB60-2.5'	2.5-3	11/20/2006	ND(1)		7.4	HY
	TB60-6.5'	6.5-7	11/20/2006	ND(1)		ND(5)	
TB61	TB61-2.5'	2.5-3	2/26/2007	ND(1)		ND(5)	
	TB61-7.0'	7-7.5	2/26/2007	35	HY	6.2	L
TB63	TB63-3.5'	3.5-4	2/26/2007	6.2	HY	33	HL
	TB63-6.0'	6-6.5	2/26/2007	ND(1)		ND(5)	
	TB63-9.0'	9-9.5	2/26/2007	ND(1)		ND(5)	
TB64	TB64-2.0'	2-2.5	2/26/2007	29	HY	170	L
	TB64-6.0'	6-6.5	2/26/2007	ND(0.99)		ND(5)	
	TB64-9.0'	9-9.5	2/26/2007	ND(1)		ND(5)	
TB65	TB65-2.5'	2.5-3	2/26/2007	ND(1)		ND(5)	
	TB65-7.0'	7-7.5	2/26/2007	ND(1)		ND(5)	
TB66	TB66-2.0'	2-2.5	2/26/2007	ND(0.99)		5.2	YZ
	TB66-7.0'	7-7.5	2/26/2007	ND(1)		ND(5)	
Shallow (<3 meters bgs) Soil ESL <sup>1</sup>				100 <sup>2</sup> /400 <sup>3</sup>		500 <sup>2</sup> /1,000 <sup>3</sup>	
Deep (>3 meters bgs) Soil ESL <sup>1</sup>				5,000		5,000	

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

<sup>2</sup> = 0 to 3 feet bgs interval, including samples collected from 3 to 3.5 feet bgs

<sup>3</sup> = 3 to 10 feet bgs interval, excluding soil samples collected from 3 to 3.5 feet bgs

Results exceeding ESLs are shaded

bgs = below ground surface

mg/kg = milligrams per kilogram

ND = Not detected at or above the indicated laboratory reporting limit

TPH = Total petroleum hydrocarbons

H = Heavier hydrocarbons contributed to the quantitation

Y = Sample exhibits chromatographic pattern which does not resemble standard

L = Lighter hydrocarbons contributed to the quantitation

Z = Sample exhibits unknown single peak or peaks

**Table 4**  
**Volatile Organic Compounds in Soil**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	Acetone (µg/kg)	sec-Butylbenzene (µg/kg)	n-Butylbenzene (µg/kg)
TB4	TB4-2'	2-2.5	9/20/2006	ND(16)	ND(3.9)	ND(3.9)
	TB4-7'	7-7.5	9/20/2006	ND(18)	ND(4.5)	ND(4.5)
TB5	TB5-2'	2-2.5	9/20/2006	ND(19)	ND(4.6)	ND(4.6)
	TB5-5.5'	5.5-6	9/20/2006	ND(17)	ND(4.2)	ND(4.2)
TB6	TB6-2.5'	2.5-3	9/20/2006	ND(20)	ND(5.1)	ND(5.1)
	TB6-6'	6-6.5	9/20/2006	ND(18)	ND(4.4)	ND(4.4)
TB7	TB7-2.5'	2.5-3	9/20/2006	ND(24)	ND(6)	ND(6)
	TB7-6.5'	6.5-7	9/20/2006	ND(18)	ND(4.4)	ND(4.4)
TB8	TB8-3'	3-3.5	9/20/2006	ND(17)	ND(4.2)	ND(4.2)
	TB8-6.5'	6.5-7	9/20/2006	ND(17)	ND(4.2)	ND(4.2)
TB9	TB9-2'	2-2.5	9/20/2006	ND(22)	ND(5.4)	ND(5.4)
	TB9-6'	6-6.5	9/20/2006	ND(18)	ND(4.5)	ND(4.5)
TB10	TB10-1.75'	1.75-2.25	9/20/2006	ND(17)	ND(4.3)	ND(4.3)
	TB10-5.5'	5.5-6	9/20/2006	ND(19)	ND(4.8)	ND(4.8)
TB11	TB11-2'	2-2.5	9/20/2006	ND(17)	ND(4.2)	ND(4.2)
	TB11-6'	6-6.5	9/20/2006	ND(15)	ND(3.8)	ND(3.8)
TB12	TB12-2'	2-2.5	9/20/2006	ND(19)	ND(4.6)	ND(4.6)
	TB12-7'	7-7.5	9/20/2006	ND(18)	ND(4.5)	ND(4.5)
TB13	TB13-3'	3-3.5	9/20/2006	ND(16)	ND(4)	ND(4)
	TB13-7'	7-7.5	9/20/2006	ND(18)	ND(4.5)	ND(4.5)
TB14	TB14-3'	3-3.5	9/25/2006	ND(16)	ND(3.9)	ND(3.9)
	TB14-7'	7-7.5	9/25/2006	ND(19)	ND(4.6)	ND(4.6)
TB15	TB15-2.5'	2.5-3	9/21/2006	ND(19)	ND(4.7)	ND(4.7)
	TB15-6.5'	6.5-7	9/21/2006	ND(16)	ND(3.9)	ND(3.9)
TB16	TB16-3'	3-3.5	9/21/2006	ND(17)	ND(4.2)	ND(4.2)
	TB16-6.5'	6.5-7	9/21/2006	ND(16)	ND(4.1)	ND(4.1)
TB17	TB17-3'	3-3.5	9/21/2006	ND(24)	ND(6)	ND(6)
	TB17-7'	7-7.5	9/21/2006	ND(17)	ND(4.2)	ND(4.2)
TB22	TB22-2.5'	2.5-3	9/21/2006	ND(17)	ND(4.2)	ND(4.2)
	TB22-6.5'	6.5-7	9/21/2006	23	ND(4.8)	ND(4.8)
TB23	TB23-2.5'	2.5-3	9/26/2006	ND(16)	ND(4)	ND(4)
	TB23-7'	7-7.5	9/26/2006	ND(17)	ND(4.2)	ND(4.2)
TB26	TB26-3'	3-3.5	9/22/2006	ND(24)	ND(6.1)	ND(6.1)
	TB26-6'	6-6.5	9/22/2006	ND(19)	ND(4.6)	ND(4.6)
TB27	TB27-3'	3-3.5	9/22/2006	ND(17)	ND(4.2)	ND(4.2)
	TB27-5.5'	5.5-6	9/22/2006	ND(18)	ND(4.4)	ND(4.4)
TB28	TB28-2.5'	2.5-3	9/22/2006	ND(16)	ND(4)	ND(4)
	TB28-7'	7-7.5	9/22/2006	ND(18)	ND(4.5)	ND(4.5)
TB29	TB29-2.5'	2.5-3	9/25/2006	ND(18)	ND(4.5)	ND(4.5)
	TB29-5.5'	5.5-6	9/25/2006	ND(16)	ND(3.9)	ND(3.9)
TB30	TB30-2.5'	2.5-3	9/25/2006	ND(17)	ND(4.2)	ND(4.2)
	TB30-7'	7-7.5	9/25/2006	ND(17)	ND(4.2)	ND(4.2)
TB31	TB31-3'	3-3.5	9/25/2006	ND(17)	ND(4.3)	ND(4.3)
	TB31-7'	7-7.5	9/25/2006	ND(16)	ND(3.9)	ND(3.9)
TB32	TB32-2.5'	2.5-3	9/26/2006	33	ND(4.6)	ND(4.6)
	TB32-6.5'	6.5-7	9/26/2006	ND(19)	ND(4.6)	ND(4.6)
TB33	TB33-3'	3-3.5	9/25/2006	ND(19)	ND(4.6)	ND(4.6)
	TB33-6'	6-6.5	9/25/2006	ND(18)	ND(4.4)	ND(4.4)
TB34	TB34-2.5'	2.5-3	9/26/2006	ND(17)	ND(4.3)	ND(4.3)
	TB34-7'	7-7.5	9/26/2006	ND(16)	ND(4)	ND(4)
TB35	TB35-2'	2-2.5	9/26/2006	ND(16)	ND(3.9)	ND(3.9)
	TB35-6.5'	6.5-7	9/26/2006	ND(16)	ND(4.1)	ND(4.1)

**Table 4**  
**Volatile Organic Compounds in Soil**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	Acetone (µg/kg)	sec-Butylbenzene (µg/kg)	n-Butylbenzene (µg/kg)
TB36	TB36-2'	2-2.5	9/26/2006	ND(18)	ND(4.4)	ND(4.4)
	TB36-7'	7-7.5	9/26/2006	ND(18)	ND(4.4)	ND(4.4)
TB37	TB37-2.5'	2.5-3	9/26/2006	ND(17)	ND(4.3)	ND(4.3)
	TB37-7'	7-7.5	9/26/2006	ND(17)	ND(4.2)	ND(4.2)
TB38	TB38-3'	3-3.5	9/27/2006	ND(21)	ND(5.3)	ND(5.3)
	TB38-5.5'	5.5-6	9/27/2006	ND(16)	ND(4.1)	ND(4.1)
TB39	TB39-2'	2-2.5	9/26/2006	ND(15)	ND(3.8)	ND(3.8)
	TB39-7'	7-7.5	9/26/2006	ND(16)	ND(4)	ND(4)
TB40	TB40-2.5'	2.5-3	9/27/2006	ND(17)	ND(4.3)	ND(4.3)
	TB40-6'	6-6.5	9/27/2006	ND(19)	ND(4.6)	ND(4.6)
TB41	TB41-2.5'	2.5-3	9/27/2006	ND(19)	ND(4.7)	ND(4.7)
	TB41-7'	7-7.5	9/27/2006	ND(16)	ND(4.1)	ND(4.1)
TB42	TB42-1.5'	1.5-2	9/27/2006	ND(23)	ND(5.8)	ND(5.8)
	TB42-7'	7-7.5	9/27/2006	ND(16)	ND(4)	ND(4)
TB43	TB43-3'	3-3.5	9/28/2006	ND(16)	ND(4.1)	ND(4.1)
	TB43-6.75'	6.75-7.25	9/28/2006	ND(15)	ND(3.7)	ND(3.7)
TB44	TB44-2.5'	2.5-3	9/28/2006	ND(18)	ND(4.5)	ND(4.5)
	TB44-6.5'	6.5-7	9/28/2006	ND(19)	ND(4.8)	ND(4.8)
TB45	TB45-2'	2-2.5	9/28/2006	ND(18)	ND(4.5)	ND(4.5)
	TB45-7'	7-7.5	9/28/2006	ND(17)	ND(4.2)	ND(4.2)
TB46	TB46-2'	2-2.5	9/28/2006	22	ND(4.4)	ND(4.4)
	TB46-7'	7-7.5	9/28/2006	ND(17)	ND(4.3)	ND(4.3)
TB47	TB47-3'	3-3.5	9/28/2006	ND(17)	ND(4.3)	ND(4.3)
	TB47-7'	7-7.5	9/28/2006	ND(18)	ND(4.5)	ND(4.5)
TB56	TB56-2.5'	2.5-3	11/20/2006	ND(16)	ND(4)	ND(4)
	BT56-7'	7-7.5	11/20/2006	ND(19)	ND(4.8)	ND(4.8)
TB57	TB57-3'	3-3.5	11/20/2006	ND(16)	ND(4.1)	ND(4.1)
	TB57-6.5'	8.5-9	11/20/2006	ND(17)	13	6.8
	TB57-11.5'	11.5-12	11/20/2006	ND(17)	ND(4.3)	ND(4.3)
TB58	TB58-3'	3-3.5	11/20/2006	ND(18)	ND(4.5)	ND(4.5)
	TB58-7'	7-7.5	11/20/2006	ND(17)	ND(4.3)	ND(4.3)
TB59	TB59-3'	3-3.5	11/20/2006	ND(19)	ND(4.7)	ND(4.7)
	TB59-7'	7-7.5	11/20/2006	ND(18)	ND(4.5)	ND(4.5)
TB60	TB60-2.5'	2.5-3	11/20/2006	ND(20)	ND(4.9)	ND(4.9)
	TB60-6.5'	6.5-7	11/20/2006	ND(17)	ND(4.3)	ND(4.3)
TB63	TB63-3.5'	3.5-4	2/26/2007	ND(17)	ND(4.2)	ND(4.2)
	TB63-6.0'	6-6.5	2/26/2007	ND(20)	ND(5)	ND(5)
	TB63-9.0'	9-9.5	2/26/2007	ND(18)	ND(4.5)	ND(4.5)
TB64	TB64-2.0'	2-2.5	2/26/2007	ND(16)	ND(4.1)	ND(4.1)
	TB64-6.0'	6-6.5	2/26/2007	ND(16)	ND(4)	ND(4)
	TB64-9.0'	9-9.5	2/26/2007	ND(18)	ND(4.4)	ND(4.4)
Shallow (<3 meters bgs) soil ESL <sup>1</sup>				500,000	NE	NE
Deep (>3 meters bgs) soil ESL <sup>1</sup>				1,000,000	NE	NE

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

bgs = Below ground surface

µg/kg = Micrograms per kilograms

ND = Not detected at or above the indicated laboratory reporting limit

NE = Not established

Table 5  
Metals in Soil  
Other Areas (Fabrication Buildings Area)  
Napa Pipe Facility  
Napa, California

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	Chromium VI (mg/kg)	pH
TB8	TB8-3'	3-3.5	9/20/2006	ND(3)	ND(0.25)	22	0.22	ND(0.25)	15	3.0	15	2.6	ND(0.02)	ND(1)	8.9	ND(0.25)	ND(0.25)	ND(0.25)	31	38	NA	NA
	TB8-6.5'	6.5-7	9/20/2006	ND(3)	5.6	160	0.74	ND(0.25)	61	8.0	13	7.8	0.12	ND(1)	56	0.7	ND(0.25)	ND(0.25)	54	33	NA	NA
TB12	TB12-2'	2-2.5	9/20/2006	ND(3)	2.5	130	0.42	ND(0.26)	63	8.1	17	8.4	0.62	ND(1)	53	ND(0.26)	ND(0.26)	ND(0.26)	49	30	NA	NA
	TB12-7'	7-7.5	9/20/2006	ND(3)	2.9	160	0.43	ND(0.25)	61	33	14	5.6	0.10	ND(1)	170	1.2	ND(0.25)	ND(0.25)	49	48	NA	NA
TB17	TB17-3'	3-3.5	9/21/2006	ND(3)	ND(0.27)	11	0.50	ND(0.27)	2.0	ND(1)	0.92	1.1	ND(0.02)	ND(1)	2.1	ND(0.27)	ND(0.27)	ND(0.27)	2.9	12	NA	NA
	TB17-7'	7-7.5	9/21/2006	12	14	380	0.94	ND(0.28)	61	10	15	5.3	0.089	ND(1)	71	ND(0.28)	ND(0.28)	ND(0.28)	56	39	NA	NA
TB27	TB27-3'	3-3.5	9/22/2006	ND(3)	3.1	120	0.43	ND(0.25)	36	9.2	14	5.2	0.12	ND(1)	42	1.0	ND(0.25)	ND(0.25)	37	34	NA	NA
	TB27-5.5'	5.5-6	9/22/2006	ND(3)	5.0	100	0.66	ND(0.25)	40	12	15	5.2	0.23	ND(1)	62	ND(0.25)	ND(0.25)	ND(0.25)	42	36	NA	NA
TB29	TB29-2.5'	2.5-3	9/25/2006	ND(3)	6.1	240	0.96	ND(0.25)	68	15	20	8.0	0.13	ND(1)	88	ND(0.25)	ND(0.25)	ND(0.25)	60	44	ND(0.05)	NA
	TB29-5.5'	5.5-6	9/25/2006	ND(3)	4.7	300	0.71	0.26	48	9.6	14	6.1	0.12	1.1	68	ND(0.25)	ND(0.25)	ND(0.25)	52	130	ND(0.05)	NA
TB30	TB30-2.5'	2.5-3	9/25/2006	ND(3)	1.7	130	0.49	ND(0.25)	51	11	11	7.7	0.11	ND(1)	46	ND(0.25)	ND(0.25)	ND(0.25)	42	27	ND(0.05)	NA
	TB30-7'	7-7.5	9/25/2006	ND(3)	3.7	390	0.55	0.26	58	14	19	5.2	0.11	ND(1)	120	ND(0.25)	ND(0.25)	ND(0.25)	54	46	ND(0.05)	NA
TB31	TB31-3'	3-3.5	9/25/2006	ND(3)	3.8	120	0.64	ND(0.25)	47	9.3	15	7.3	0.058	ND(1)	57	ND(0.25)	ND(0.25)	ND(0.25)	59	47	ND(0.05)	NA
	TB31-7'	7-7.5	9/25/2006	ND(3)	6.6	150	0.54	ND(0.25)	110	13	18	4.6	0.15	ND(1)	82	ND(0.25)	ND(0.25)	ND(0.25)	75	46	ND(0.05)	NA
TB37	TB37-2.5'	2.5-3	9/26/2006	ND(3)	3.9	240	0.45	ND(0.25)	35	12	21	5.3	0.039	ND(1)	58	ND(0.25)	ND(0.25)	ND(0.25)	39	49	ND(0.05)	NA
	TB37-7'	7-7.5	9/26/2006	ND(3)	5.9	150	0.45	ND(0.25)	57	14	17	5.1	0.13	ND(1)	63	ND(0.25)	ND(0.25)	ND(0.25)	60	48	ND(0.05)	NA
TB38	TB38-3'	3-3.5	9/27/2006	ND(3)	6.3	56	0.97	ND(0.25)	4.3	4.2	11	15	ND(0.02)	1.4	11	0.59	ND(0.25)	ND(0.25)	6.9	50	ND(0.05)	NA
	TB38-5.5'	5.5-6	9/27/2006	ND(3)	0.61	94	0.49	ND(0.25)	46	13	17	7.3	0.16	ND(1)	58	ND(0.25)	ND(0.25)	ND(0.25)	27	37	0.09	NA
TB39	TB39-2'	2-2.5	9/26/2006	ND(3)	2.8	150	0.45	ND(0.25)	35	12	14	5.5	0.034	ND(1)	40	0.58	ND(0.25)	ND(0.25)	36	31	0.07	NA
	TB39-7'	7-7.5	9/26/2006	ND(3)	4.9	79	0.73	ND(0.27)	42	11	15	5.8	0.11	ND(1)	61	0.60	ND(0.27)	ND(0.27)	47	40	0.06	NA
TB59	TB59-3'	3-3.5	11/20/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.05)	NA
	TB59-7'	7-7.5	11/20/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.05)	NA
TB60	TB60-2.5'	2.5-3	11/20/2006	ND(3)	1.3	17	0.69	0.56	1.1	1.5	5.7	8.2	0.038	ND(1)	2.3	ND(0.25)	ND(0.25)	ND(0.25)	6.4	63	ND(0.05)	NA
	TB60-6.5'	6.5-7	11/20/2006	ND(3)	2.4	300	0.62	1.1	41	12	20	6.5	0.097	ND(1)	69	ND(0.25)	ND(0.27)	ND(0.27)	50	78	ND(0.05)	NA
TB62	TB62-2.0'	2-2.5	2/26/2007	ND(0.50)	1.5	56	0.93	ND(0.26)	2.4	0.85	4.7	6.3	ND(0.02)	ND(0.26)	1.9	ND(0.50)	ND(0.26)	1.0	2.9	54	ND(0.05)	6.7
	TB62-6.0'	6-6.5	2/26/2007	ND(0.50)	3.6	140	0.51	ND(0.25)	35	22	15	8.5	0.053	ND(0.25)	39	ND(0.50)	ND(0.25)	1.5	41	29	ND(0.05)	7.9
	TB62-9.0'	9-9.5	2/26/2007	ND(0.50)	6.5	76	0.54	ND(0.25)	48	9.3	19	6.6	0.073	ND(0.25)	56	ND(0.50)	0.26	1.5	49	41	ND(0.05)	7.1
TB63	TB63-3.5'	3.5-4	2/26/2007	ND(0.50)	1.4	65	0.42	ND(0.25)	7.3	5.6	7.8	5.4	0.069	ND(0.25)	15	ND(0.50)	ND(0.25)	ND(0.50)	31	38	ND(0.05)	12.0
	TB63-6.0'	6-6.5	2/26/2007	0.51	5.5	65	0.57	ND(0.25)	61	7.8	14	6.5	0.097	ND(0.25)	53	ND(0.50)	0.26	1.6	55	29	ND(0.05)	8.4
	TB63-9.0'	9-9.5	2/26/2007	0.57	3.2	55	0.42	ND(0.25)	31	8.4	14	7.8	0.12	ND(0.25)	46	ND(0.50)	ND(0.25)	ND(0.50)	33	55	ND(0.05)	7.2
TB64	TB64-2.0'	2-2.5	2/26/2007	0.74	5.5	71	0.47	ND(0.25)	84	6.8	24	17	0.22	ND(0.25)	47	ND(0.50)	0.35	1.2	47	53	ND(0.05)	7.3
	TB64-6.0'	6-6.5	2/26/2007	ND(0.50)	5.1	93	0.70	ND(0.25)	98	27	20	7.9	0.17	ND(0.25)	71	ND(0.50)	0.28	1.8	57	40	ND(0.05)	7.7
	TB64-9.0'	9-9.5	2/26/2007	ND(0.50)	5.0	54	0.54	ND(0.25)	49	11	16	5.8	0.25	ND(0.25)	47	ND(0.50)	0.33	1.0	48	35	ND(0.05)	7.4
Shallow (<3 meters bgs) Soil ESL <sup>1</sup>				6.1	5.5	750	4.0	1.7	58	10	230	150	3.7	40	150	10	20	1.0	110	600	1.8	NE

**Notes:**  
ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).  
Results exceeding ESLs are shaded  
bgs = Below ground surface  
mg/kg = Milligrams per kilogram  
ND = Not detected at or above the indicated laboratory reporting limit  
NA = Not analyzed

**Table 6**  
**TPH as Diesel and TPH as Motor Oil in Groundwater**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

<b>Sample Location</b>	<b>Sample Identification</b>	<b>Sample Date</b>	<b>TPH as Diesel (µg/l)</b>		<b>TPH as Motor Oil (µg/l)</b>	
TB4	TB4-W	9/26/2006	<b>56</b>	Y	ND(300)	
TB5	TB5-W	9/25/2006	<b>360</b>	HY	<b>740</b>	
TB6	TB6-W	9/20/2006	ND(50)		ND(300)	
TB7	TB7-W	9/20/2006	ND(50)		ND(300)	
TB8	TB8-W	9/20/2006	ND(50)		ND(300)	
TB9	TB9-W	9/20/2006	ND(50)		ND(300)	
TB10	TB10-W	9/20/2006	ND(50)		ND(300)	
TB11	TB11-W	9/27/2006	<b>370</b>	HY	<b>420</b>	
TB12	TB12-W	9/21/2006	<b>58,000</b>	HY	<b>18,000</b>	LY
TB13	TB13-W	9/21/2006	<b>120</b>	Y	ND(300)	
TB14	TB14-W	9/29/2006	<b>92</b>	HY	ND(300)	
TB15	TB15-W	9/21/2006	ND(50)		ND(300)	
TB16	TB16-W	9/21/2006	ND(50)		ND(300)	
TB17	TB17-W	9/21/2006	<b>71</b>	Y	ND(300)	
TB22	TB22-W	9/21/2006	<b>130</b>	LY	ND(300)	
TB23	TB23-W	10/31/2006	ND(50)		ND(300)	
TB26	TB26-W	9/22/2006	ND(50)		ND(300)	
TB27	TB27-W	9/22/2006	ND(60)		ND(300)	
TB28	TB28-W	9/22/2006	ND(50)		ND(300)	
TB29	TB29-W	9/25/2006	ND(90)		ND(300)	
TB30	TB30-W	9/26/2006	ND(50)		ND(300)	
TB31	TB31-W	9/28/2006	ND(50)		ND(300)	
TB32	TB32-W	9/27/2006	ND(50)		ND(300)	
TB33	TB33-W	9/28/2006	ND(50)		ND(300)	
TB34	TB34-W	9/29/2006	<b>68</b>	Y	ND(300)	
TB35	TB35-W	9/28/2006	ND(50)		ND(300)	
TB36	TB36-W	9/28/2006	<b>50</b>	Y	ND(300)	
TB37	TB37-W	9/27/2006	<b>57</b>	Y	ND(300)	
TB38	TB38-W	9/28/2006	ND(50)		ND(300)	
TB39	TB39-W	9/27/2006	<b>56</b>	Y	ND(300)	
TB40	TB40-W	9/28/2006	ND(50)		ND(300)	
TB41	TB41-W	9/28/2006	<b>51</b>	Y	ND(300)	
TB42	TB42-W	9/28/2006	ND(50)		ND(300)	
TB43	TB43-W	9/29/2006	ND(50)		ND(300)	
TB44	TB44-W	9/28/2006	<b>290</b>	Y	<b>1,700</b>	H
TB45	TB45-W	9/28/2006	<b>73</b>	Y	<b>410</b>	
TB46	TB46-W	9/28/2006	ND(50)		ND(300)	
TB47	TB47-W	9/28/2006	ND(50)		ND(300)	

**Table 6**  
**TPH as Diesel and TPH as Motor Oil in Groundwater**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Date	TPH as Diesel (µg/l)		TPH as Motor Oil (µg/l)	
TB53	TB53-W	11/1/2006	130	HY	630	H
TB54	TB54-W	11/1/2006	ND(50)		ND(300)	
TB56	TB56-W	11/20/2006	ND(50)		ND(300)	
TB57	TB57-W	11/20/2006	130,000		7,200	LY
TB58	TB58-W	11/20/2006	70	HY	410	H
TB59	TB59-W	11/20/2006	55,000		3,600	LY
TB60	TB60-W	11/20/2006	9,600	H	2,200	HL
TB61	TB61-W	2/26/2007	ND(50)		ND(300)	
TB63	TB63-W	2/26/2007	ND(50)		ND(300)	
TB64	TB64-W	2/26/2007	ND(50)		ND(300)	
TB65	TB65-W	2/26/2007	130	Y	ND(300)	
TB66	TB66-W	2/26/2007	ND(50)		ND(300)	
<b>Groundwater ESL<sup>1</sup></b>			<b>2,500</b>		<b>2,500</b>	

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

µg/l = Micrograms per liter

ND = Not detected at or above the indicated laboratory reporting limit

TPH = Total petroleum hydrocarbons

H = Heavier hydrocarbons contributed to the quantitation

Y = Sample exhibits chromatographic pattern which does not resemble standard

L = Lighter hydrocarbons contributed to the quantitation



Table 7  
Volatile Organic Compounds in Groundwater  
Other Areas (Fabrication Buildings Area)  
Napa Pipe Facility  
Napa, California

Sample Location	Sample Identification	Sample Date	1,1-DCA (µg/l)	1,2-DCA (µg/l)	2-Butanone (µg/l)	Acetone (µg/l)	Chloroform (µg/l)	Isopropylbenzene (µg/l)	MTBE (µg/l)	Propylbenzene (µg/l)	tert-Butylbenzene (µg/l)	n-Butylbenzene (µg/l)	sec-Butylbenzene (µg/l)
TB4	TB4-W	9/25/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB5	TB5-W	9/21/2006	ND(0.5)	ND(0.5)	ND(10)	16	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB6	TB6-W	9/20/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB7	TB7-W	9/20/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB8	TB8-W	9/20/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB9	TB9-W	9/20/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB10	TB10-W	9/20/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB11	TB11-W	9/26/2006	ND(0.5)	0.5	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB12	TB12-W	9/21/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	1.0	2.4
TB13	TB13-W	9/21/2006	ND(0.5)	0.5	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB14	TB14-W	9/28/2006	ND(0.5)	ND(0.5)	17	76	0.5	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB15	TB15-W	9/21/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB16	TB16-W	9/21/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB17	TB17-W	9/21/2006	1.2	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB22	TB22-W	9/21/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB23	TB23-W	10/31/2006	ND(4.8)	ND(4.8)	ND(9.6)	ND(9.6)	ND(4.8)	ND(4.8)	ND(0.5)	ND(4.8)	ND(4.8)	ND(4.8)	ND(4.8)
TB26	TB26-W	9/22/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB27	TB27-W	9/22/2006	1.3	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB28	TB28-W	9/22/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB29	TB29-W	9/25/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB30	TB30-W	9/26/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB31	TB31-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB32	TB32-W	9/26/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB33	TB33-W	9/27/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB34	TB34-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB35	TB35-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB36	TB36-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB37	TB37-W	9/27/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB38	TB38-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB39	TB39-W	9/27/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB40	TB40-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB41	TB41-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB42	TB42-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB43	TB43-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB44	TB44-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB45	TB45-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB46	TB46-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB47	TB47-W	9/28/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB56	TB56-W	11/20/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB57	TB57-W	11/20/2006	0.6	ND(0.5)	ND(10)	ND(10)	ND(0.5)	2.2	ND(0.5)	1.2	0.6	3.2	4.7
TB58	TB58-W	11/20/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB59	TB59-W	11/20/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB60	TB60-W	11/20/2006	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TB63	TB63-W	2/26/2007	ND(0.5)	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	6.5	ND(0.5)	ND(0.5)	ND(0.5)	6.5
TB64	TB64-W	2/26/2007	0.9	ND(0.5)	ND(10)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Groundwater ESL <sup>1</sup>			1,000	200	50,000	50,000	330	NE	1,800	NE	NE	NE	NE

Notes:

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

µg/l = Micrograms per liter

DCA = Dichloroethane

MTBE = methyl-tert-butyl ether

ND = Not detected at or above the indicated laboratory reporting limit

NE = Not established

**Table 8**  
**Metals in Groundwater**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Date	Arsenic (µg/l)	Barium (µg/l)	Cobalt (ug/l)	Chromium (ug/l)	Copper (ug/l)	Molybdenum (µg/l)	Nickel (µg/l)	Vanadium (µg/l)	Zinc (µg/l)	Hexavalent Chromium (µg/l)	pH
TB29	TB29-W	9/26/2006	ND(5)	12	ND(20)	ND(10)	ND(10)	ND(20)	ND(20)	ND(10)	ND(20)	NA	NA
TB30	TB30-W	9/26/2006	ND(5)	26	ND(20)	ND(10)	ND(10)	86	ND(20)	ND(10)	ND(20)	NA	NA
TB31	TB31-W	9/28/2006	ND(5)	22	ND(20)	ND(10)	ND(10)	40	ND(20)	ND(10)	ND(20)	NA	NA
TB32	TB32-W	9/27/2006	6.5	110	ND(20)	ND(10)	ND(10)	43	ND(20)	ND(10)	ND(20)	NA	NA
TB33	TB33-W	9/28/2006	ND(5)	39	ND(20)	ND(10)	ND(10)	38	ND(20)	12	35	NA	NA
TB34	TB34-W	9/28/2006	ND(5)	44	ND(20)	ND(10)	ND(10)	29	30	15	ND(20)	NA	NA
TB35	TB35-W	9/28/2006	ND(5)	21	ND(20)	ND(10)	ND(10)	ND(20)	ND(20)	ND(10)	ND(20)	NA	NA
TB37	TB37-W	9/28/2006	ND(5)	31	ND(20)	ND(10)	ND(10)	ND(20)	ND(20)	ND(10)	ND(20)	NA	NA
TB38	TB38-W	9/28/2006	ND(5)	54	ND(20)	ND(10)	ND(10)	ND(20)	26	ND(10)	ND(20)	NA	NA
TB39	TB39-W	9/28/2006	ND(5)	36	ND(20)	ND(10)	ND(10)	ND(20)	ND(20)	ND(10)	ND(20)	NA	NA
TB40	TB40-W	9/28/2006	52	75	ND(20)	ND(10)	ND(10)	22	ND(20)	ND(10)	ND(20)	NA	NA
TB41	TB41-W	9/28/2006	18	79	ND(20)	ND(10)	ND(10)	ND(20)	46	ND(10)	ND(20)	NA	NA
TB42	TB42-W	9/28/2006	ND(5)	48	ND(20)	ND(10)	ND(10)	ND(20)	ND(20)	ND(10)	26	NA	NA
TB43	TB43-W	9/28/2006	ND(5)	76	ND(20)	ND(10)	ND(10)	34	ND(20)	ND(10)	ND(20)	NA	NA
TB59	TB59-W	11/20/2006	ND(5)	87	ND(20)	ND(10)	ND(10)	ND(20)	25	ND(10)	56	ND(0.01)	NA
TB60	TB60-W	11/20/2006	ND(5)	85	ND(20)	ND(10)	ND(10)	ND(20)	22	ND(10)	26	ND(0.01)	NA
TB62	TB62-W	2/27/2007	ND(5)	19	ND(5)	ND(5)	ND(5)	36	6.3	ND(5)	ND(20)	ND(0.01)	6.5
TB63	TB63-W	2/27/2007	ND(5)	54	12	ND(5)	ND(5)	13	12	ND(5)	68	ND(0.01)	6.8
TB64	TB64-W	2/27/2007	5.5	29	5.4	7.8	7.3	23	19	7.8	25	ND(0.01)	6.9
<b>Groundwater ESL<sup>1</sup></b>			<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>NE</b>

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening

Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

ND = Not detected at or above the indicated laboratory reporting limit

µg/l = Micrograms per liter

NA = Not analyzed

**Table 9**  
**TPH as Diesel and TPH as Motor Oil in Soil**  
**Other Areas (Former Double-Enders Building)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	TPH as Diesel (mg/kg)		TPH as Motor Oil (mg/kg)	
DE1	DE1-3'	3-3.5	9/19/2006	1.7	HY	14	H
	DE1-7'	7-7.5	9/19/2006	ND(0.99)		ND(5)	
DE2	DE2-3'	3-3.5	9/19/2006	3.7	HY	35	H
	DE2-6.5'	6.5-7	9/19/2006	ND(1)		ND(5)	
DE3	DE3-2.5'	2.5-3	9/21/2006	ND(1)		ND(5)	
	DE3-7'	7-7.5	9/21/2006	ND(1)		ND(5)	
DE4	DE4-2.5'	2.5-3	11/1/2006	12	HY	100	H
	DE4-7'	7-7.5	11/1/2006	ND(1)		ND(5)	
DE5	DE5-2.5'	2.5-3	9/21/2006	ND(1)		ND(5)	
	DE5-7'	7-7.5	9/21/2006	ND(0.99)		ND(5)	
DE6	DE6-3'	3-3.5	11/1/2006	97	HY	1,400	H
	DE6-7'	7-7.5	11/1/2006	39	HY	530	H
DE7	DE7-2.5'	2.5-3	9/21/2006	ND(0.99)		ND(5)	
	DE7-6.5'	6.5-7	9/21/2006	5.5	HY	19	L
DE8	DE8-3'	3-3.5	9/21/2006	ND(0.99)		ND(5)	
	DE8-7'	7-7.5	9/21/2006	ND(1)		ND(5)	
DE9	DE9-3'	3-3.5	9/25/2006	ND(1)		ND(5)	
	DE9-6.5'	6.5-7	9/25/2006	1.8	HY	17	
DE10	DE10-2.5'	2.5-3	9/25/2006	2.9	HY	30	H
	DE10-7'	7-7.5	9/25/2006	1.2	HY	ND(5)	
<b>Shallow (&lt;3 meters bgs) Soil ESL<sup>1</sup></b>				<b>500<sup>2</sup>/750<sup>3</sup></b>		<b>2,500</b>	

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for commercial/industrial land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

<sup>2</sup> = 0 to 3 feet bgs interval, including samples collected from 3 to 3.5 feet bgs

<sup>3</sup> = 3 to 10 feet bgs interval, excluding soil samples collected from 3 to 3.5 feet bgs

Results exceeding ESLs are shaded

bgs = below ground surface

mg/kg = milligrams per kilogram

ND = Not detected at or above the indicated laboratory reporting limit

TPH = Total petroleum hydrocarbons

H = Heavier hydrocarbons contributed to the quantitation

Y = Sample exhibits chromatographic pattern which does not resemble standard

L = Lighter hydrocarbons contributed to the quantitation

**Table 10**  
**Volatile Organic Compounds in Soil**  
**Other Areas (Former Double-Enders Building)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	Acetone (µg/kg)	Methylene Chloride (µg/kg)	2-Butanone (µg/kg)
DE1	DE1-3'	3-3.5	9/19/2006	ND(17)	ND(17)	ND(8.6)
	DE1-7'	7-7.5	9/19/2006	ND(19)	ND(19)	ND(9.4)
DE2	DE2-3'	3-3.5	9/19/2006	<b>26</b>	ND(19)	ND(9.3)
	DE2-6.5'	6.5-7	9/19/2006	ND(16)	ND(16)	ND(8.2)
DE3	DE3-2.5'	2.5-3	9/21/2006	<b>21</b>	ND(16)	ND(9.1)
	DE3-7'	7-7.5	9/21/2006	ND(17)	ND(17)	ND(8.3)
DE4	DE4-2.5'	2.5-3	11/1/2006	ND(25)	ND(20)	ND(9.8)
	DE4-7'	7-7.5	11/1/2006	ND(25)	ND(20)	ND(10)
DE5	DE5-2.5'	2.5-3	9/21/2006	ND(19)	ND(19)	ND(9.6)
	DE5-7'	7-7.5	9/21/2006	ND(21)	ND(21)	ND(11)
DE6	DE6-3'	3-3.5	11/1/2006	<b>54</b>	<b>200 &gt;LR</b>	<b>15</b>
	DE6-7'	7-7.5	11/1/2006	ND(24)	<b>29</b>	ND(9.4)
DE7	DE7-2.5'	2.5-3	9/21/2006	ND(19)	ND(19)	ND(9.3)
	DE7-6.5'	6.5-7	9/21/2006	<b>26</b>	ND(19)	ND(11)
DE8	DE8-3'	3-3.5	9/21/2006	<b>21</b>	ND(16)	ND(8.8)
	DE8-7'	7-7.5	9/21/2006	ND(16)	ND(16)	ND(8.2)
DE9	DE9-3'	3-3.5	9/25/2006	ND(17)	ND(17)	ND(8.6)
	DE9-6.5'	6.5-7	9/25/2006	ND(18)	ND(18)	ND(8.9)
DE10	DE10-2.5'	2.5-3	9/25/2006	ND(16)	ND(16)	ND(8.2)
	DE10-7'	7-7.5	9/25/2006	ND(16)	ND(16)	ND(8.1)
<b>Shallow (&lt;3 meters bgs) soil ESL<sup>1</sup></b>				<b>1,000,000</b>	<b>1,500</b>	<b>1,000,000</b>

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening

Level (ESL) for commercial/industrial land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

bgs = Below ground surface

µg/kg = Micrograms per kilograms

ND = Not detected at or above the indicated laboratory reporting limit

Table 11  
Metals in Soil  
Other Areas (Former Double-Ender Building)  
Napa Pipe Facility  
Napa, California

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
DE1	DE1-3'	3-3.5	9/19/2006	ND(3)	2.8	99	0.81	ND(0.25)	24	6.7	11	6.3	0.059	ND(1)	27	0.62	ND(0.25)	28	33
	DE1-7'	7-7.5	9/19/2006	ND(3)	ND(0.27)	110	0.62	ND(0.27)	44	15	29	6.7	0.14	ND(1)	61	ND(0.27)	ND(0.27)	43	57
DE9	DE9-3'	3-3.5	9/25/2006	ND(3)	4.2	60	1.0	ND(0.98)	2.4	ND(1)	3.2	12	ND(0.02)	1.0	2.3	ND(0.98)	ND(0.98)	6.8	58
	DE9-6.5'	6.5-7	9/25/2006	ND(3)	4.0	120	0.59	ND(0.25)	41	13	23	9.5	0.066	1.2	60	0.75	ND(0.25)	46	47
DESS1	DESS1	0.5-1	9/29/2006	4.1	120	520	ND(0.1)	2.1	67	63	110	67	0.044	13	87	35	33	54	160
DESS2	DESS2	0.5-1	9/29/2006	ND(3)	2.5	31	0.37	ND(0.25)	10	3.1	6.7	19	ND(0.02)	ND(1)	5.1	0.37	7.8	3.7	57
DESS3	DESS3	0.5-1	9/29/2006	ND(3)	5.0	78	0.22	0.35	51	19	43	8.7	0.35	6.5	42	1.2	2.9	75	87
DESS4	DESS4	0.5-1	9/29/2006	ND(3)	4.1	48	0.28	ND(0.25)	57	8.8	100	14	0.059	16	26	0.73	1.1	34	81
Shallow (<3 meters bgs) Soil ESL <sup>1</sup>				40	5.5	1,500	8	7.4	58	10	230	750	10	40	150	10	40	200	600

**Notes:**  
ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for commercial/industrial land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).  
Results exceeding ESLs are shaded  
bgs = Below ground surface  
mg/kg = Milligrams per kilogram  
ND = Not detected at or above the indicated laboratory reporting limit  
NA = Not analyzed

**Table 12**  
**TPH as Diesel and TPH as Motor Oil in Groundwater**  
**Other Areas (Former Double-Enders Building)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Date	TPH as Diesel (ug/l)		TPH as Motor Oil (ug/l)	
DE1	DE1-W	9/21/2006	ND(70)		ND(300)	
DE2	DE2-W	9/21/2006	ND(70)		ND(300)	
DE3	DE3-W	9/25/2006	ND(60)		ND(300)	
DE4	DE4-W	11/1/2006	110	HY	1,800	H
DE5	DE5-W	9/25/2006	ND(70)		ND(300)	
DE6	DE6-W	11/2/2006	1,100	HY	11,000	H
DE7	DE7-W	9/25/2006	140	HY	ND(300)	
DE8	DE8-W	9/25/2006	ND(90)		ND(300)	
DE9	DE9-W	9/27/2006	55	Y	ND(300)	
DE10	DE10-W	9/29/2006	69	Y	ND(300)	
<b>Groundwater ESL<sup>1</sup></b>			<b>2,500</b>		<b>2,500</b>	

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

µg/l = Micrograms per liter

ND = Not detected at or above the indicated laboratory reporting limit

TPH = Total petroleum hydrocarbons

H = Heavier hydrocarbons contributed to the quantitation

Y = Sample exhibits chromatographic pattern which does not resemble standard

**Table 13**  
**Volatile Organic Compounds in Groundwater**  
**Other Areas (Former Double-Enders Building)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Date	1,1-DCA (µg/l)	1,1-DCE (µg/l)	cis-1,2-DCE (µg/l)	Acetone (µg/l)	Toluene (µg/l)	Xylenes (µg/l)
DE1	DE1-W	9/20/2006	ND(0.5)	ND(0.5)	ND(0.5)	11	ND(0.5)	ND(0.5)
DE2	DE2-W	9/20/2006	ND(0.5)	ND(0.5)	ND(0.5)	ND(10)	ND(0.5)	ND(0.5)
DE3	DE3-W	9/25/2006	ND(0.5)	ND(0.5)	ND(0.5)	ND(10)	ND(0.5)	ND(0.5)
DE4	DE4-W	11/1/2006	ND(0.5)	ND(0.5)	ND(0.5)	ND(10)	0.7	0.7
DE5	DE5-W	9/25/2006	ND(0.5)	ND(0.5)	ND(0.5)	ND(10)	ND(0.5)	ND(0.5)
DE6	DE6-W	11/2/2006	20	6.7	1.3	ND(10)	0.9	0.8
DE7	DE7-W	9/25/2006	ND(0.5)	ND(0.5)	ND(0.5)	18	ND(0.5)	ND(0.5)
DE8	DE8-W	9/25/2006	ND(0.5)	ND(0.5)	ND(0.5)	17	ND(0.5)	ND(0.5)
DE9	DE9-W	9/26/2006	0.6	ND(0.5)	ND(0.5)	22	ND(0.5)	ND(0.5)
DE10	DE10-W	9/29/2006	ND(0.5)	ND(0.5)	ND(0.5)	42	ND(0.5)	ND(0.5)
<b>Groundwater ESL<sup>1</sup></b>			<b>1,000</b>	<b>6,300</b>	<b>6,200</b>	<b>50,000</b>	<b>400</b>	<b>5,300</b>

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

µg/l = Micrograms per liter

DCA = Dichloroethane

DCE = Dichloroethene

ND = Not detected at or above the indicated laboratory reporting limit

**Table 14**  
**TPH as Diesel and TPH as Motor Oil in Soil**  
**Other Areas (Former Internal Coating Building)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	TPH as Diesel (mg/kg)		TPH as Motor Oil (mg/kg)	
IC1	IC1-3'	3-3.5	9/25/2006	2.3	HY	15	
	IC1-7'	7-7.5	9/25/2006	3.2	HY	25	
IC2	IC2-3'	3-3.5	9/19/2006	ND(1)		ND(5)	
	IC2-6.25'	6.25-6.75	9/19/2006	ND(1)		ND(5)	
IC3	IC3-6.5'	6.5-7	9/25/2006	ND(1)		ND(5)	
IC4	IC4-2.5'	2.5-3	9/19/2006	160	HY	1,200	
	IC4-6'	6-6.5	9/19/2006	ND(1)		ND(5)	
IC5	IC5-4'	4-4.5	9/27/2006	3.4	HYb	18	HLb
	IC5-6.5'	6.5-7	9/27/2006	ND(0.99)		ND(5)	
IC6	IC6-3'	3-3.5	9/19/2006	ND(1)		ND(5)	
	IC6-7'	7-7.5	9/19/2006	ND(1)		ND(5)	
IC7	IC7-1.75'	1.75-2.25	9/27/2006	ND(1)		ND(5)	
	IC7-5.5'	5.5-6	9/27/2006	1.2	Y	ND(5)	
Shallow (<3 meters bgs) Soil ESL <sup>1</sup>				100 <sup>2</sup> /400 <sup>3</sup>		500 <sup>2</sup> /1,000 <sup>3</sup>	

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

<sup>2</sup> = 0 to 3 feet bgs interval, including samples collected from 3 to 3.5 feet bgs

<sup>3</sup> = 3 to 10 feet bgs interval, excluding soil samples collected from 3 to 3.5 feet bgs

Results exceeding ESLs are shaded

bgs = below ground surface

mg/kg = milligrams per kilogram

ND = Not detected at or above the indicated laboratory reporting limit

TPH = Total petroleum hydrocarbons

H = Heavier hydrocarbons contributed to the quantitation

Y = Sample exhibits chromatographic pattern which does not resemble standard

L = Lighter hydrocarbons contributed to the quantitation

b = Low surrogate recovery was observed for hexacosane in IC5-4'. The sample was re-extracted outside of hold time. The results for the re-extraction were similar, but higher. Therefore, the reextracted results are reported.



**Table 15**  
**Volatile Organic Compounds in Soil**  
**Other Areas (Former Internal Coating Building)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	Acetone (µg/kg)
IC1	IC1-3'	3-3.5	9/25/2006	ND(19)
	IC1-7'	7-7.5	9/25/2006	<b>18</b>
IC2	IC2-3'	3-3.5	9/19/2006	ND(16)
	IC2-6.25'	6.25-6.75	9/19/2006	ND(19)
IC3	IC3-6.5'	6.5-7	9/25/2006	ND(19)
IC4	IC4-2.5'	2.5-3	9/19/2006	ND(16)
	IC4-6'	6-6.5	9/19/2006	<b>22</b>
IC5	IC5-4'	4-4.5	9/27/2006	ND(16)
	IC5-6.5'	6.5-7	9/27/2006	ND(17)
IC6	IC6-3'	3-3.5	9/19/2006	ND(17)
	IC6-7'	7-7.5	9/19/2006	ND(20)
IC7	IC7-1.75'	1-75-2.25	9/27/2006	<b>16</b>
	IC7-5.5'	5.5-6	9/27/2006	ND(18)
<b>Shallow (&lt;3 meters bgs) soil ESL<sup>1</sup></b>				<b>500,000</b>

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

bgs = Below ground surface

µg/kg = Micrograms per kilogram

ND = Not detected at or above the indicated laboratory reporting limit.

**Table 16**  
**Metals in Soil**  
**Other Areas (Former Internal Coating Building)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
IC2	IC2-3'	3-3.5	9/19/2006	3.4	160	0.52	41	12	20	6.4	0.11	74	ND(0.25)	42	45
	IC2-6.25'	6.25-6.75	9/19/2006	11	220	0.58	43	29	21	10	0.066	90	0.37	50	42
IC4	IC4-2.5'	2.5-3	9/19/2006	1.9	18	0.50	ND(0.5)	ND(1)	1.4	5.3	ND(0.02)	ND(1)	ND(0.25)	3.4	43
	IC4-6'	6-6.5	9/19/2006	4.4	160	0.59	55	14	25	8.5	0.16	66	ND(0.25)	55	39
IC7	IC7-1.75'	1.75-2.25	9/27/2006	3.0	85	0.81	13	4.6	8.7	7.0	ND(0.02)	25	0.72	17	44
	IC7-5.5'	5.5-6	9/27/2006	2.5	150	0.54	47	12	22	7.4	0.15	55	0.39	48	36
<b>Shallow (&lt;3 meters bgs) Soil ESL<sup>1</sup></b>				<b>5.5</b>	<b>750</b>	<b>4.0</b>	<b>58</b>	<b>10</b>	<b>230</b>	<b>150</b>	<b>3.7</b>	<b>150</b>	<b>10</b>	<b>110</b>	<b>600</b>

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

bgs = Below ground surface

mg/kg = Milligrams per kilogram

ND = Not detected at or above the indicated laboratory reporting limit

**Table 17**  
**TPH as Diesel and TPH as Motor Oil in Groundwater**  
**Other Areas (Former Internal Coating Building)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Date	TPH as Diesel (ug/l)		TPH as Motor Oil (ug/l)	
IC1	IC1-W	9/26/2006	150	Y	ND(300)	
IC2	IC2-W	9/20/2006	ND(50)		ND(300)	
IC3	IC3-W	9/26/2006	370	HY	430	L
IC4	IC4-W	9/26/2006	250		ND(300)	
IC5	IC5-W	9/28/2006	ND(50)		ND(300)	
IC6	IC6-W	9/26/2006	ND(50)		ND(300)	
IC7	IC7-W	9/28/2006	58	Y	ND(300)	
<b>Groundwater ESL<sup>1</sup></b>			<b>2,500</b>		<b>2,500</b>	

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

µg/l = Micrograms per liter

ND = Not detected at or above the indicated laboratory reporting limit

TPH = Total petroleum hydrocarbons

H = Heavier hydrocarbons contributed to the quantitation

Y = Sample exhibits chromatographic pattern which does not resemble standard

L = Lighter hydrocarbons contributed to the quantitation

**Table 18**  
**Volatile Organic Compounds in Groundwater**  
**Other Areas (Former Internal Coating Building)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Date	2-Butanone (µg/l)	Acetone (µg/l)	Chloroform (µg/l)	Xylenes (µg/l)	Toluene (µg/l)	Trichloro-fluoromethane (µg/l)
IC1	IC1-W	9/26/2006	15	76	0.6	ND(0.5)	0.6	ND(1)
IC2	IC2-W	9/20/2006	ND(10)	10	ND(0.5)	0.9	1.5	ND(1)
IC3	IC3-W	9/26/2006	20	100	4.0	ND(0.5)	ND(0.5)	8.0
IC4	IC4-W	9/20/2006	ND(10)	ND(10)	ND(0.5)	0.6	1.0	ND(1)
IC5	IC5-W	9/28/2006	ND(10)	24	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)
IC6	IC6-W	9/20/2006	ND(10)	ND(10)	ND(0.5)	ND(0.5)	0.9	ND(1)
IC7	IC7-W	9/28/2006	ND(10)	12	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)
<b>Groundwater ESL<sup>1</sup></b>			<b>50,000</b>	<b>50,000</b>	<b>330</b>	<b>5,300</b>	<b>400</b>	<b>NE</b>

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening

Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

µg/l = Micrograms per liter

ND = Not detected at or above the indicated laboratory reporting limit.

NE = Not established

**Table 19**  
**TPH as Diesel and TPH as Motor Oil in Soil**  
**Other Areas (Former Acid Drain Line)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	TPH as Diesel (mg/kg)		TPH as Motor Oil (mg/kg)	
ADL1	ADL1-2.5'	2.5-3	9/19/2006	1.0	HY	ND(5)	
	ADL1-6.5'	6.5-7	9/19/2006	1.1	HY	ND(5)	
ADL2	ADL2-2'	2-2.5	9/19/2006	1.5	HY	9.3	H
	ADL2-6.5'	6.5-7	9/19/2006	ND(1)		ND(5)	
ADL3	ADL3-2.5'	2.5-3	9/19/2006	4.5	Y	ND(5)	
	ADL3-6.5'	6.5-7	9/19/2006	ND(1)		ND(5)	
<b>Shallow (&lt;3 meters bgs) Soil ESL<sup>1</sup></b>				<b>100<sup>2</sup>/400<sup>3</sup></b>		<b>500<sup>2</sup>/1,000<sup>3</sup></b>	

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

<sup>2</sup> = 0 to 3 feet bgs interval, including samples collected from 3 to 3.5 feet bgs

<sup>3</sup> = 3 to 10 feet bgs interval, excluding soil samples collected from 3 to 3.5 feet bgs

Results exceeding ESLs are shaded

bgs = below ground surface

mg/kg = milligrams per kilogram

ND = Not detected at or above the indicated laboratory reporting limit

TPH = Total petroleum hydrocarbons

H = Heavier hydrocarbons contributed to the quantitation

Y = Sample exhibits chromatographic pattern which does not resemble standard

**Table 20**  
**Metals in Soil**  
**Other Areas (Former Acid Drain Line)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Depth (Feet bgs)	Sample Date	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	Hexavalent Chromium (mg/kg)
ADL1	ADL1-2.5'	2.5-3	9/19/2006	2.5	150	0.51	41	11	20	6.1	0.099	77	ND(0.25)	40	42	ND(0.05)
	ADL1-6.5'	6.5-7	9/19/2006	3.5	140	0.56	39	12	18	6.4	0.14	68	ND(0.25)	39	41	ND(0.05)
ADL2	ADL2-2'	2-2.5	9/19/2006	1.6	27	0.35	ND(0.5)	ND(1)	1.2	4.7	0.026	ND(1)	ND(0.25)	2.6	42	ND(0.05)
	ADL2-6.5'	6.5-7	9/19/2006	2.0	180	0.49	54	14	16	8.2	0.057	65	ND(0.25)	46	33	ND(0.05)
ADL3	ADL3-2.5'	2.5-3	9/19/2006	1.3	170	0.59	22	21	9.6	8.4	ND(0.02)	15	1.3	93	42	ND(0.05)
	ADL3-6.5'	6.5-7	9/19/2006	3.1	120	0.58	46	12	19	7.8	0.077	66	ND(0.25)	45	40	ND(0.05)
<b>Shallow (&lt;3 meters bgs) Soil ESL<sup>1</sup></b>				<b>5.5</b>	<b>750</b>	<b>4.0</b>	<b>58</b>	<b>10</b>	<b>230</b>	<b>150</b>	<b>3.7</b>	<b>150</b>	<b>10</b>	<b>110</b>	<b>600</b>	<b>1.8</b>

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

bgs = Below ground surface

mg/kg = Milligrams per kilogram

ND = Not detected at or above the indicated laboratory reporting limit

**Table 21**  
**TPH as Diesel and TPH as Motor Oil in Groundwater**  
**Other Areas (Former Acid Drain Line)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Date	TPH as Diesel (ug/l)		TPH as Motor Oil (ug/l)	
ADL1	ADL1-W	9/19/2006	110	Y	ND(330)	
ADL2	ADL2-W	9/19/2006	81	Y	ND(350)	
ADL3	ADL3-W	9/19/2006	230	HY	1,300	
ADL4	ADL4-W	11/3/2006	160	HY	970	
ADL5	ADL5-W	11/6/2006	ND(50)		ND(300)	
ADL6	ADL6-W	11/6/2006	ND(50)		ND(300)	
<b>Groundwater ESL<sup>1</sup></b>			<b>2,500</b>		<b>2,500</b>	

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

µg/l = Micrograms per liter

ND = Not detected at or above the indicated laboratory reporting limit

H = Heavier hydrocarbons contributed to the quantitation

Y = Sample exhibits chromatographic pattern which does not resemble standard

**Table 22**  
**Volatile Organic Compounds in Groundwater**  
**Other Areas (Former Acid Drain Line)**  
**Napa Pipe Facility**  
**Napa, California**

Sample Location	Sample Identification	Sample Date	Acetone (µg/l)
ADL1	ADL1-W	9/19/2006	ND(10)
ADL2	ADL2-W	9/19/2006	ND(10)
ADL3	ADL3-W	9/19/2006	<b>29</b>
<b>Groundwater ESL<sup>1</sup></b>			<b>50,000</b>

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

µg/l = Micrograms per liter

ND = Not detected at or above the indicated laboratory reporting limit



**Table 23**  
**Metals in Groundwater**  
**Other Areas (Former Acid Drain Line)**  
**Napa Pipe Facility**  
**Napa, California**

<b>Sample Location</b>	<b>Sample Identification</b>	<b>Sample Date</b>	<b>Arsenic (µg/l)</b>	<b>Barium (µg/l)</b>	<b>Cobalt (µg/l)</b>	<b>Nickel (µg/l)</b>	<b>Selenium (µg/l)</b>	<b>Thallium (µg/l)</b>	<b>pH (µg/l)</b>
ADL1	ADL1-W	9/19/2006	16	500	32	21	6.8	12	6.2
ADL2	ADL2-W	9/19/2006	8.9	530	45	65	9.8	14	6.3
ADL3	ADL3-W	9/19/2006	15	840	21	ND(20)	ND(5)	8.7	6.0
ADL4	ADL4-W	11/3/2006	NA	NA	NA	NA	NA	NA	6.3
ADL5	ADL5-W	11/3/2006	NA	NA	NA	NA	NA	NA	6.5
ADL6	ADL6-W	11/3/2006	NA	NA	NA	NA	NA	NA	6.2
<b>Groundwater ESL<sup>1</sup></b>			<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>50,000</b>	<b>NE</b>

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

Results exceeding ESLs are shaded

ND = Not detected at or above the indicated laboratory reporting limit

µg/l = Micrograms per liter

NA = Not analyzed

NE = Not established

**Table 24**  
**Summary of TPH as Diesel and TPH as Motor Oil in Soil**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (mg/kg)	Minimum Detection (mg/kg)	Number of Samples	Number of Detections	Frequency of Detection	Shallow (<3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	Deep (>3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	# of Detections Above ESL
TPH-d	1,300	ND	103	45	44%	100 <sup>2</sup> /400 <sup>3</sup>	5,000	3
TPH-mo	880	ND	103	35	34%	500 <sup>2</sup> /1,000 <sup>3</sup>	5,000	1

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

<sup>2</sup> = 0 to 3 feet bgs interval, including samples collected from 3 to 3.5 feet bgs

<sup>3</sup> = 3 to 10 feet bgs interval, excluding soil samples collected from 3 to 3.5 feet bgs

bgs = Below ground surface

mg/kg = milligrams per kilogram

ND = Not detected

TPH = Total petroleum hydrocarbons

TPH-d = TPH as diesel

TPH-mo = TPH as motor oil

**Table 25**  
**Summary of Metals in Soil**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (mg/kg)	Minimum Detection (mg/kg)	Number of Samples	Number of Detections	Frequency of Detection	Shallow (<3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	Deep (>3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	# of Detections Above ESL	Background <sup>2</sup> (mg/kg)	# of Detections Above Background
Antimony	12	ND	31	4	13%	6.1	280	1	NE	N/A
Arsenic	14	ND	31	29	94%	5.5	5.5	7	15.3	0
Barium	390	11	31	31	100%	750	2,500	0	248	4
Beryllium	0.97	0.22	31	31	100%	4.0	36	0	NE	N/A
Cadmium	1.1	ND	31	4	13%	1.7	38	0	13.7	0
Chromium	110	1.1	31	31	100%	58	58	9	98	1
Chromium VI	0.09	ND	25	3	12%	1.8	1.8	0	NE	N/A
Cobalt	33	ND	31	30	97%	10	10	15	NE	N/A
Copper	24	0.92	31	31	100%	230	2,500	0	49	0
Lead	17	1.1	31	31	100%	150	750	0	27	0
Molybdenum	1.4	ND	31	2	6%	40	2,500	0	NE	N/A
Mercury	0.62	ND	31	27	87%	3.7	98	0	0.69	0
Nickel	170	1.9	31	31	100%	150	1,000	1	125	1
Selenium	1.2	ND	31	6	19%	10	2,500	0	0.9	2
Silver	0.35	ND	31	5	16%	20	2,500	0	NE	N/A
Thallium	1.8	ND	31	7	23%	1.0	47	5	NE	N/A
Vanadium	75	2.9	31	31	100%	110	2,500	0	NE	N/A
Zinc	130	12	31	31	100%	600	2,500	0	134	0

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

bgs = Below ground surface

mg/kg = milligrams per kilogram

ND = Not detected

NE = No established ESL or background level

N/A = Not applicable

Background<sup>2</sup> = Proposed threshold concentrations, Table B-3 of James M. Montgomery, Consulting Engineers, Inc. (JMM), 1990b

**Table 26**  
**Summary of TPH as Diesel and TPH as Motor Oil in Groundwater**  
**Other Areas (Fabrication Buildings Area)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (µg/l)	Minimum Detection (µg/l)	Number of Samples <sup>1</sup> (µg/l)	Number of Detections (µg/l)	Frequency of Detection	Groundwater ESL <sup>2</sup> (µg/l)	# of Detections Above ESL
TPH-d	130,000	ND	50	21	42%	2,500	4
TPH-mo	18,000	ND	50	10	20%	2,500	3

**Notes:**

<sup>1</sup> = Unless otherwise noted, groundwater results from PES's 2006 *Supplemental Remedial Investigation* were used to compile the information presented on this table.

ESL<sup>2</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

µg/l = Micrograms per liter

ND = Not detected

TPH = Total petroleum hydrocarbons

TPH-d = TPH as diesel

TPH-mo = TPH as motor oil

**Table 27**  
**Summary of Petroleum Hydrocarbons in Soil**  
**Other Areas (Former Double-Ender Building)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (mg/kg)	Minimum Detection (mg/kg)	Number of Samples	Number of Detections	Frequency of Detection	Shallow (<3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	Deep (>3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	# of Detections Above ESL
TPH-d	97	ND	20	9	45%	500 <sup>2</sup> /750 <sup>3</sup>	5,000	0
TPH-mo	1,400	ND	20	8	40%	2,500	5,000	0
TPH-ho	22,000	15	10	10	100%	2,500	5,000	2

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for commercial land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

<sup>2</sup> = 0 to 3 feet bgs interval, including samples collected from 3 to 3.5 feet bgs

<sup>3</sup> = 3 to 10 feet bgs interval, excluding soil samples collected from 3 to 3.5 feet bgs

bgs = Below ground surface

mg/kg = milligrams per kilogram

ND = Not detected

TPH = Total petroleum hydrocarbons

TPH-d = TPH as diesel

TPH-mo = TPH as motor oil

TPH-ho = TPH as hydraulic oil

**Table 28**  
**Summary of Metals in Soil**  
**Other Areas (Former Double-Ender Building)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (mg/kg)	Minimum Detection (mg/kg)	Number of Samples	Number of Detections	Frequency of Detection	Shallow (<3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	Deep (>3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	# of Detections Above ESL	Background <sup>2</sup> (mg/kg)	# of Detections Above Background
Antimony	4.1	ND	9	1	11%	40	280	0	NE	N/A
Arsenic	120	ND	9	8	89%	5.5	5.5	1	15.3	1
Barium	520	31	9	9	100%	1,500	2,500	0	248	1
Beryllium	1.0	ND	9	7	78%	8.0	36	0	NE	N/A
Cadmium	2.1	ND	9	2	22%	7.4	38	0	13.7	0
Chromium	67	ND	9	8	89%	58	58	1	98	0
Cobalt	63	ND	9	7	78%	10	10	4	NE	N/A
Copper	110	3.2	9	9	100%	230	5,000	0	49	2
Lead	67	6.3	9	9	100%	750	750	0	27	1
Molybdenum	16	ND	9	5	56%	40	3,600	0	NE	N/A
Mercury	0.35	ND	9	7	78%	10	98	0	0.69	0
Nickel	87	ND	9	8	89%	150	1,000	0	125	0
Selenium	35	ND	9	6	67%	10	3,400	1	0.9	2
Vanadium	75	3.7	9	9	100%	200	5,000	0	NE	N/A
Zinc	160	33	9	9	100%	600	5,000	0	134	1

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for commercial land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

bgs = Below ground surface

mg/kg = milligrams per kilogram

ND = Not detected

NE = No established ESL or background level

N/A = Not applicable

Background<sup>2</sup> = Proposed threshold concentrations, Table B-3 of James M. Montgomery, Consulting Engineers, Inc. (JMM), 1990b

**Table 29**  
**Summary of TPH as Diesel and TPH as Motor Oil in Groundwater**  
**Other Areas (Former Double-Ender Building)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (µg/l)	Minimum Detection (µg/l)	Number of Samples <sup>1</sup> (µg/l)	Number of Detections (µg/l)	Frequency of Detection	Groundwater ESL <sup>2</sup> (µg/l)	# of Detections Above ESL
TPH-d	1,100	ND	10	5	50%	2,500	0
TPH-mo	11,000	ND	10	2	20%	2,500	1

**Notes:**

<sup>1</sup> = Unless otherwise noted, groundwater results from PES's 2006 *Supplemental Remedial Investigation* were used to compile the information presented on this table.

ESL<sup>2</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

µg/l = Micrograms per liter

ND = Not detected

TPH = Total petroleum hydrocarbons

TPH-d = TPH as diesel

TPH-mo = TPH as motor oil

**Table 30**  
**Summary of TPH as Diesel and TPH as Motor Oil in Soil**  
**Other Areas (Former Internal Coating Building)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (mg/kg)	Minimum Detection (mg/kg)	Number of Samples	Number of Detections	Frequency of Detection	Shallow (<3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	Deep (>3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	# of Detections Above ESL
TPH-d	160	ND	13	5	38%	100 <sup>2</sup> /400 <sup>3</sup>	5,000	1
TPH-mo	1,200	ND	13	4	31%	500 <sup>2</sup> /1,000 <sup>3</sup>	5,000	1

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

<sup>2</sup> = 0 to 3 feet bgs interval, including samples collected from 3 to 3.5 feet bgs

<sup>3</sup> = 3 to 10 feet bgs interval, excluding soil samples collected from 3 to 3.5 feet bgs

bgs = Below ground surface

mg/kg = milligrams per kilogram

ND = Not detected

TPH = Total petroleum hydrocarbons

TPH-d = TPH as diesel

TPH-mo = TPH as motor oil



**Table 31**  
**Summary of Metals in Soil**  
**Other Areas (Former Internal Coating Building)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (mg/kg)	Minimum Detection (mg/kg)	Number of Samples	Number of Detections	Frequency of Detection	Shallow (<3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	Deep (>3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	# of Detections Above ESL	Background <sup>2</sup> (mg/kg)	# of Detections Above Background
Arsenic	11	1.9	6	6	100%	5.5	5.5	1	15.3	0
Barium	220	18	6	6	100%	750	2,500	0	248	0
Beryllium	0.81	0.50	6	6	100%	4.0	36	0	NE	N/A
Chromium	55	ND	6	5	83%	58	58	0	98	0
Cobalt	29	ND	6	5	83%	10	10	4	NE	N/A
Copper	25	1.4	6	6	100%	230	2,500	0	49	0
Lead	10	5.3	6	6	100%	150	750	0	27	0
Mercury	0.16	ND	6	4	67%	3.7	98	0	0.69	0
Nickel	90	ND	6	5	83%	150	1,000	0	125	0
Selenium	0.72	ND	6	3	50%	10	2,500	0	0.9	0
Vanadium	55	3.4	6	6	100%	110	2,500	0	NE	N/A
Zinc	45	36	6	6	100%	600	2,500	0	134	0

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

bgs = Below ground surface

mg/kg = milligrams per kilogram

ND = Not detected

NE = No established ESL or background level

N/A = Not applicable

Background<sup>2</sup> = Proposed threshold concentrations, Table B-3 of James M. Montgomery, Consulting Engineers, Inc. (JMM), 1990b

**Table 32**  
**Summary of TPH as Diesel and TPH as Motor Oil in Groundwater**  
**Other Areas (Former Internal Coating Building)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (µg/l)	Minimum Detection (µg/l)	Number of Samples <sup>1</sup> (µg/l)	Number of Detections (µg/l)	Frequency of Detection	Groundwater ESL <sup>2</sup> (µg/l)	# of Detections Above ESL
TPH-d	370	ND	7	4	57%	2,500	0
TPH-mo	430	ND	7	1	14%	2,500	0

**Notes:**

<sup>1</sup> = Unless otherwise noted, groundwater results from PES's 2006 *Supplemental Remedial Investigation* were used to compile the information presented on this table.

ESL<sup>2</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

µg/l = Micrograms per liter

ND = Not detected

TPH = Total petroleum hydrocarbons

TPH-d = TPH as diesel

TPH-mo = TPH as motor oil

**Table 33**  
**Summary of TPH as Diesel and TPH as Motor Oil in Soil**  
**Other Areas (Former Acid Drain Line)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (mg/kg)	Minimum Detection (mg/kg)	Number of Samples	Number of Detections	Frequency of Detection	Shallow (<3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	Deep (>3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	# of Detections Above ESL
TPH-d	4.5	ND	6	4	67%	100 <sup>2</sup> /400 <sup>3</sup>	5,000	0
TPH-mo	9.3	ND	6	1	17%	500 <sup>2</sup> /1,000 <sup>3</sup>	5,000	0

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

<sup>2</sup> = 0 to 3 feet bgs interval, including samples collected from 3 to 3.5 feet bgs

<sup>3</sup> = 3 to 10 feet bgs interval, excluding soil samples collected from 3 to 3.5 feet bgs

bgs = Below ground surface

mg/kg = milligrams per kilogram

ND = Not detected

TPH = Total petroleum hydrocarbons

TPH-d = TPH as diesel

TPH-mo = TPH as motor oil

**Table 34**  
**Summary of Metals in Soil**  
**Other Areas (Former Acid Drain Line)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (mg/kg)	Minimum Detection (mg/kg)	Number of Samples	Number of Detections	Frequency of Detection	Shallow (<3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	Deep (>3 meters bgs) Soil ESL <sup>1</sup> (mg/kg)	# of Detections Above ESL	Background <sup>2</sup> (mg/kg)	# of Detections Above Background
Arsenic	3.5	1.3	6	6	100%	5.5	5.5	0	15.3	0
Barium	180	27	6	6	100%	750	2,500	0	248	0
Beryllium	0.59	0.35	6	6	100%	4.0	36	0	NE	N/A
Chromium	54	ND	6	5	83%	58	58	0	98	0
Chromium VI	ND	ND	6	0	0%	1.8	1.8	0	NE	N/A
Cobalt	21	ND	6	5	83%	10	10	5	NE	N/A
Copper	20	1.2	6	6	100%	230	2,500	0	49	0
Lead	8.4	4.7	6	6	100%	150	750	0	27	0
Mercury	0.14	ND	6	5	83%	3.7	98	0	0.69	0
Nickel	77	ND	6	5	83%	150	1,000	0	125	0
Selenium	1.3	ND	6	1	17%	10	2,500	0	0.9	1
Vanadium	93	2.6	6	6	100%	110	2,500	0	NE	N/A
Zinc	42	33	6	6	100%	600	2,500	0	134	0

**Notes:**

ESL<sup>1</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for residential land use where potentially impacted groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

bgs = Below ground surface

mg/kg = milligrams per kilogram

ND = Not detected

NE = No established ESL or background level

N/A = Not applicable

Background<sup>2</sup> = Proposed threshold concentrations, Table B-3 of James M. Montgomery, Consulting Engineers, Inc. (JMM), 1990b

**Table 35**  
**Summary of TPH as Diesel and TPH as Motor Oil in Groundwater**  
**Other Areas (Former Acid Drain Line)**  
**Napa Pipe Facility**  
**Napa, California**

Constituent	Maximum Detection (µg/l)	Minimum Detection (µg/l)	Number of Samples <sup>1</sup> (µg/l)	Number of Detections (µg/l)	Frequency of Detection	Groundwater ESL <sup>2</sup> (µg/l)	# of Detections Above ESL
TPH-d	230	ND	6	4	67%	2,500	0
TPH-mo	1,300	ND	6	2	33%	2,500	0

**Notes:**

<sup>1</sup> = Unless otherwise noted, groundwater results from PES's 2006 *Supplemental Remedial Investigation* were used to compile the information presented on this table.

ESL<sup>2</sup> = San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) where groundwater is not a current or potential drinking water resource and where the soil leaching to groundwater and discharge of groundwater to surface water pathway does not apply (i.e., no aquatic habitat pathway).

µg/l = Micrograms per liter

ND = Not detected

TPH = Total petroleum hydrocarbons

TPH-d = TPH as diesel

TPH-mo = TPH as motor oil

Table 36a  
Preliminary Screening of Remedial Technologies for Soil  
Napa Pipe Facility, Napa, California

Technology	Description	General Applicability/Limitations	Comments Specific to Other Areas			Retained?
			Effectiveness <sup>a</sup>	Implementability <sup>b</sup>	Relative Cost <sup>c</sup>	
Soil Vapor Extraction	Vacuum is applied to the subsurface to extract contaminant-laden soil gas. Induced concentration gradients result in desorption and mobilization of contaminants to fresh air pulled in from outside the target zone.	<p><b>Applicability.</b> Applicable to volatile organics and some fuels (Henry's law constant greater than 0.01 or vapor pressure greater than 0.5 mm Hg). Moisture content, organic content, and air permeability of soil affect applicability. Aeration by SVE can promote <i>in situ</i> aerobic biodegradation but can also limit anaerobic biodegradation.</p> <p><b>Limitations.</b> Performance is function of air permeability and contaminant volatility. High amount of fines and high degree of saturation limit airflow require higher vacuums. Stratified soils result in non-uniform airflow causing hot spots to remain. High sorption capacity can reduce removal rates. Off-gas and residual liquids may require treatment/disposal.</p>	<p><b>Low</b></p> <p>Primary site contaminants (TPH-mo and TPH-d) are not readily amenable to SVE. Unsaturated zone is not very thick and consists of low permeability silts and clays. Site lithology is not conducive to technologies relying on subsurface air flow. Potential for free product makes this technology even less viable.</p>	<p><b>Easy</b></p> <p>After all aboveground structures are removed, implementing this technology is fairly easy. The system is simple to operate and maintain, requiring no specialized skill level and experience. Equipment is readily available with numerous vendors.</p>	<p><b>Low ⑤</b></p> <p>SVE is a proven and relatively easy to operate remediation technology. System installation and operating costs are not excessive requiring no special equipment and consumables. High uncertainty since no data is available to determine long-term effectiveness and remediation duration, and contaminants are not prone to volatilization.</p>	No – due to low effectiveness.
Thermally Enhanced Soil Vapor Extraction	Hot air, steam, or soil heating is used to enhance desorption, volatilization and mobility. Vacuum is applied to subsurface to remove the volatilized contaminants.	<p><b>Applicability.</b> Technology improves volatility of VOCs and SVOCs. Heating soil may increase air permeability by drying soils or interstitial pore space. Thermally enhanced SVE can improve conditions for biodegradation of residual contaminants.</p> <p><b>Limitations.</b> Performance is function of attainable soil temperature, air permeability, and contaminant volatility. Same limitations as SVE. Offgas and residual liquids may be required treatment/disposal. Higher process temperatures require specialized equipment.</p>	<p><b>Low to Medium</b></p> <p>Thermal enhancement may provide limited improvement of contaminant extraction rates compared to SVE. Soils can become more permeable as they dry out. Motor oil range TPH contaminants will volatilize more when heated. Thin unsaturated zone, low permeability silts and clays, and heterogeneous lithology is not conducive to technologies relying on subsurface air flow. Potential for free product further reduces effectiveness.</p>	<p><b>Moderately Difficult</b></p> <p>Similar to SVE except specialized process equipment and higher temperature-rated components are needed. Also, specialized skills are required to operate and maintain the heat source systems. Boundary control becomes a challenge to ensure contaminated vapors and liquids do not contaminate previously clean areas.</p>	<p><b>Moderate to High⑤</b></p> <p>Significantly higher costs than conventional SVE due to need for high temperature rated equipment and material. Also, electrical and/or fuel costs are significantly higher to supply the heat source. Shallow water table may require additional measures to ensure contaminated vapors are not released from the site. Maximum soil temperatures may be limited by low air permeability and shallow water table. High uncertainty since no data is available to determine long-term effectiveness and remediation duration. Site lithology not conducive to technologies relying on subsurface air flow.</p>	No – due to low effectiveness and relatively high cost

Table 36a  
Preliminary Screening of Remedial Technologies for Soil  
Napa Pipe Facility, Napa, California

Technology	Description	General Applicability/Limitations	Comments Specific to Other Areas			Retained?
			Effectiveness <sup>a</sup>	Implementability <sup>b</sup>	Relative Cost <sup>c</sup>	
Excavation	Contaminated soils are excavated using standard construction techniques such as excavators, bulldozers, and scrapers. Excavation of saturated soils may require dewatering. Excavated soils are managed using other remediation technologies depending on contaminant type and concentration, cleanup levels, and regulatory requirements.	<p><b>Applicability.</b> Excavation of soils above water table is a common remediation method. Relatively shallow unsaturated zone minimizes excavation volumes and limits need for shoring or slope stabilization. Excavation of soils below water table is less common, but limited depth of contamination below the water table makes this approach feasible.</p> <p><b>Limitations.</b> Requires heavy construction equipment. Potential free phase product and high concentrations may present safety concerns requiring engineering controls to prevent exposure and fire/explosion. Silty/clayey soils may involve additional handling requirements.</p>	<p><b>High</b></p> <p>Impacted soil and contaminants are removed and no longer provide a potential source of exposure or secondary source of contamination to groundwater.</p>	<p><b>Moderately Easy</b></p> <p>After all aboveground structures are removed, excavation is fairly straightforward to implement using standard construction techniques. Large excavations below the water table will require dewatering and/or specialized excavation methods.</p>	<p><b>Moderate ①</b></p> <p>Large contaminated area and potential need to use respiratory equipment and handle contaminated soils and free phase product increase costs. Also, all contaminants are excavated and clean boundaries are confirmed via on-site sampling.</p>	Yes – effective and readily implemented at reasonable cost.
<i>Ex Situ</i> Low Temperature Thermal Desorption	Excavated soil is processed through an aboveground low temperature thermal desorption (LTTD) unit where it is heated to upwards of 600°F. Contaminants volatilize and are removed and treated in the vapor phase. Clean soils can be used as backfill material. Pre-processing of contaminated soils may be required to remove debris or oversize material, reduce moisture content to <20 to 30%, and reduce excessively high contaminant concentrations.	<p><b>Applicability.</b> Site contaminants will desorb at temperatures achievable by LTTD and are readily destroyed in standard vapor phase treatment systems (e.g., thermal oxidizers).</p> <p><b>Limitations.</b> Moisture content of saturated soils and silty/clayey soils may involve additional handling requirements (e.g., drying). Large LTTD units require significant mobilization of equipment and access to large supplies of natural gas or propane. Operation of LTTD units will likely require air discharge permitting and associated emission limits.</p>	<p><b>High</b></p> <p>LTTD is a proven technology that has been shown effective at reducing contaminant concentrations to well below site cleanup levels. Effective operation results in soil suitable for reuse and destruction of contaminants in vapor phase treatment systems.</p>	<p><b>Moderately Difficult</b></p> <p>LTTD units of the size potentially required at Site are large specialized systems and require significant mobilization and setup. Permitting requirements can be significant, but rarely prevent operations. Once set up, operations are relatively straightforward and involve providing a constant feed of contaminated soil to the LTTD unit, operation and monitoring of the unit itself, and managing the treated soils.</p>	<p><b>Moderate to High ③</b></p> <p>Fuel requirements to run the LTTD unit increase operating costs. Contaminants are heated well above the boiling point, and soils can be blended to ensure soil is uniformly heated. Soils excavated from the capillary fringe will be wet and likely require drying. Although this is a proven technology for the site contaminants and confirmation sampling documents treatment effectiveness, moderate uncertainty associated with permitting requirements and exact nature of soil pre-processing requirements.</p>	Yes – effective and implementable for site contaminants at moderate cost.

**Table 36a**  
**Preliminary Screening of Remedial Technologies for Soil**  
**Napa Pipe Facility, Napa, California**

Technology	Description	General Applicability/Limitations	Comments Specific to Other Areas			Retained?
			Effectiveness <sup>a</sup>	Implementability <sup>b</sup>	Relative Cost <sup>c</sup>	
Incineration	Excavated soil is processed through an aboveground incinerator unit where it is heated to high temperatures (upwards of 1,800°F). Contaminants are destroyed due to the high combustion temperatures. Clean soils can be used as backfill material.	<p><b>Applicability.</b> Use of incinerator requires mobilizing a unit to the site (readily available technology). Contaminants are suitable for high temperature volatilization and removal/destruction.</p> <p><b>Limitations.</b> Moisture content of saturated soils and silty/clayey soils may involve additional handling requirements. Large soil incineration units require significant mobilization of equipment and access to large supplies of natural gas or propane. Operation of incinerator unit will likely require air discharge permitting and associated emission limits.</p>	<p><b>High</b></p> <p>Incineration is a proven technology that has been shown effective at reducing contaminant concentrations to well below site cleanup levels. Effective operation results in soil suitable for reuse.</p>	<p><b>Moderately Difficult</b></p> <p>Incineration units of the size potentially required at the Site are large and specialized systems and require significant mobilization and setup. Permitting requirements can be significant.</p>	<p><b>High ③</b></p> <p>Due to significantly higher operational temperatures, incinerators are more expensive to build and operate, with large fuel requirements increasing operating costs. Soils excavated from the capillary fringe will be wet and likely require drying. Although this is a proven technology for the site contaminants, the moderate uncertainty is associated with permitting requirements and exact nature of soil pre-processing requirements.</p>	No – Higher costs compared to LTTD with no benefit.
In-Pile Thermal Desorption	Excavated soil is stockpiled in engineered cells with embedded thermal desorption heaters and extractors. A heat source adds thermal energy to the pile to volatilize VOCs and SVOCs. Depending on the temperature (upwards of 1,600°F), contaminants can be destroyed or extracted and treated. Clean soils can be used as backfill material.	<p><b>Applicability.</b> Contaminants are susceptible to high temperature volatilization and removal/destruction. Large available land area to set up cells.</p> <p><b>Limitations.</b> Requires heavy construction equipment. Contaminant aeration is likely during excavation, potentially requiring respiratory protection for on-site workers. Potential free phase product and high concentrations present safety concerns due to exposure and fire/explosion. Desorbed vapors and drained liquids require containment measures and treatment systems.</p>	<p><b>High</b></p> <p>Thermal desorption is a proven technology that has been shown effective at reducing contaminant concentrations, although in-pile technique utilized less than continuous feed LTTD and incineration technologies. Effective operation results in soil suitable for reuse and destruction of contaminants in vapor phase treatment systems.</p>	<p><b>Moderately Difficult to Difficult</b></p> <p>Specialized skills and experience required to operate the IPTD system. If necessary, vapor treatment technologies are readily available for diesel and motor oil.</p>	<p><b>High ④</b></p> <p>Large contaminated area and potential need to use respiratory equipment and handle contaminated soils and free phase product increase costs. Fuel or electrical requirements to provide the heat source increase operating costs. Uncertainty higher compared to LTTD due to difficulties ensuring uniform treatment and management of vapors and liquids from piles.</p>	No – higher cost and uncertainty compared to LTTD.
<i>In Situ</i> Thermal Desorption (ISTD)	ISTD is similar to In-Pile Thermal Desorption except heat is applied in-situ (without excavation) through heater wells and contaminant vapors extracted through heated extraction wells. The thermal energy is transmitted to the subsurface via thermal convection and radiant heating to volatilize VOCs and SVOCs. Temperatures of greater than 1,000°F can be achieved. Contaminants can be destroyed in situ or extracted and treated.	<p><b>Applicability.</b> Site contaminants are susceptible to high temperature volatilization and removal/destruction.</p> <p><b>Limitations.</b> Sites with thin contaminated zones less suited to technology due to cost considerations. Certain underground utilities can must be removed prior to treatment.</p>	<p><b>High</b></p> <p>Thermal desorption is a proven technology that has been shown effective at reducing contaminant concentrations.</p>	<p><b>Moderately Difficult to Difficult</b></p> <p>Specialized skills and experience required to operate the ISTD system. If necessary, vapor treatment technologies are readily available for diesel and motor oil.</p>	<p><b>High ④</b></p> <p>Relatively thin contaminated zone significantly increases unit cost of ISTD compared to other thermal technologies. Uncertainty higher compared to LTTD due to difficulties ensuring uniform treatment and collection and treatment of vapors from subsurface.</p>	No – higher cost and uncertainty compared to <i>Ex Situ</i> LTTD.



**Table 36a**  
**Preliminary Screening of Remedial Technologies for Soil**  
**Napa Pipe Facility, Napa, California**

Technology	Description	General Applicability/Limitations	Comments Specific to Other Areas			Retained?
			Effectiveness <sup>a</sup>	Implementability <sup>b</sup>	Relative Cost <sup>c</sup>	
Bioventing	Oxygen is delivered <i>in situ</i> by forced air movement to stimulate aerobic biodegradation.	<p><b>Applicability.</b> Generally applies to aerobic biodegradation of contaminants sorbed to soil particles. Target contaminants are typically petroleum hydrocarbons, nonchlorinated solvents, and other organic chemicals.</p> <p><b>Limitations.</b> Shallow water table, saturated soils, high concentrations and/or free phase product, and low permeability soils reduce bioventing performance.</p>	<p><b>Low</b></p> <p>Could enhance aerobic degradation in areas with lower contaminant concentrations. Unsaturated zone is not very thick and consists of low permeability silts and clays. Potential free product and high contaminant concentrations may be too toxic for effective biodegradation.</p>	<p><b>Easy</b></p> <p>After all aboveground structures are removed, implementing this technology is fairly easy. The system is easy to operate and maintain, requiring no specialized skill level and experience. Also, the equipment is readily available with numerous vendors.</p>	<p><b>Low ⑤</b></p> <p>Adding oxygen to the subsurface involves easy-to-operate and fairly common equipment. High uncertainty since biodegradation rates adversely affected by high contaminant concentrations and potential free phase product. Also, site lithology not conducive to technologies relying on subsurface air flow.</p>	No – ineffective due to site conditions.
Bio-Piling	Excavated soils are stockpiled in engineered cells with embedded injectors to add oxygen, nutrients, and/or amendments as needed to stimulate biodegradation. Clean soils can be used as backfill material.	<p><b>Applicability.</b> Similar to bioventing except <i>ex situ</i>. Target contaminants are typically petroleum hydrocarbons, nonchlorinated solvents, and other organic chemicals. Large available land area to set up cells.</p> <p><b>Limitations.</b> Potential free phase product and high concentrations present safety concerns due to exposure, and may be toxic to bacteria. Potential vapors and drained liquids may require containment measures and treatment. Depending on biodegradation rates, cleanup levels, and quantity of soil requiring remediation, treatment can a significant amount of time (months or years).</p>	<p><b>Medium to High</b></p> <p>Could enhance aerobic degradation in areas with low to moderate contaminant concentrations. Silts and clays are low permeability, which would adversely affect airflow through the pile. Potential free product and high contaminant concentrations may inhibit bioactivity. These factors may improve with proper blending/mixing with cleaner more permeable soils.</p>	<p><b>Moderate</b></p> <p>Skill and experience requirements to construct and operate biopiles are relatively common. Equipment requirements are minimal, and equipment is readily available. Management of vapors and liquids increase complexity.</p>	<p><b>Low to Moderate ④</b></p> <p>Large contaminated area and potential need to use respiratory equipment and handle contaminated soils and free phase product increase costs. Higher uncertainty since biodegradation rates are unknown and would need to be evaluated in treatability studies. Rates adversely affected by high contaminant concentrations and potential free phase product.</p>	Yes – effective and implementable treatment at moderate cost.
Landfarming	Excavated soil is spread in thin layers on the ground. Soil is aerated by tilling and/or plowing to stimulate biodegradation. Nutrients or amendments can be utilized if needed. Clean soils can be used as backfill material.	<p><b>Applicability.</b> Similar to bio-piling, except land requirements are significantly higher in order to set up “landfarms”.</p> <p><b>Limitations.</b> Similar to bio-piling, except more difficult to control moisture content since landfarms are not typically covered and are exposed to rainfall. Also more difficult to control vapors.</p>	<p><b>Medium</b></p> <p>Similar to bio-piling except it can be more difficult to control factors effecting biodegradation (e.g., moisture content, temperature). Technology may not be effective during wet season due to excessive rainfall.</p>	<p><b>Moderately Easy</b></p> <p>Skills, experience and equipment requirements to implement this technology are minimal. Because soil is treated in relatively shallow lifts, treatment of large volumes of soil require either very large areas to conduct treatment or longer treatment periods to process multiple lifts.</p>	<p><b>Low ④</b></p> <p>Costs lower than bio-piling due to minimal equipment and operational requirements. Uncertainty similar to or slightly higher than bio-piling due to potential impacts of rainfall on performance.</p>	Yes – potentially effective treatment at low cost.

**Table 36a**  
**Preliminary Screening of Remedial Technologies for Soil**  
**Napa Pipe Facility, Napa, California**

Technology	Description	General Applicability/Limitations	Comments Specific to Other Areas			Retained?
			Effectiveness <sup>a</sup>	Implementability <sup>b</sup>	Relative Cost <sup>c</sup>	
Monitored Natural Attenuation	Natural processes (volatilization, biodegradation, adsorption, and chemical reactions) are used to reduce contaminant concentrations to acceptable levels.	<p><b>Applicability.</b> Natural attenuation is a common element of cleanup programs for fuel hydrocarbons and halogenated VOCs. Can be used to manage residual contamination following site stabilization and source control activities. Timeframe for cleanup not consistent with RAOs.</p> <p><b>Limitations.</b> Extensive site characterization, modeling, and monitoring are required to document the natural attenuation of the contaminants. High contaminant concentrations and/or free phase product limit applicability of biodegradation. Similarly, higher molecular weight contaminants hinder volatilization.</p>	<p><b>Low</b></p> <p>As compared to other remedial technologies, use of MNA will take much longer (e.g., decades) to achieve cleanup levels. Diesel and motor oil are not amenable to volatilization, and areas of high concentrations and/or free phase product may be toxic to the bacteria.</p>	<p><b>Moderately Easy</b></p> <p>The required equipment, skills, and experience to implement monitored natural attenuation is minimal, although extensive sampling and analysis are needed to baseline the process and monitor ongoing progress.</p>	<p><b>Low ⑤</b></p> <p>Because there are no major equipment and construction requirements, the cost to implement this technology is low although long-term monitoring costs could be significant. The uncertainty of achieving the RAOs is high since contaminant concentrations have remained high after many years of potential bioactivity. High concentrations and free product inhibit natural biodegradation, and the site contaminants are not amenable to natural volatilization.</p>	No –not suitable to achieve cleanup goals.
<i>In Situ</i> Chemical Oxidation	Strong oxidizer is injected into subsurface to oxidize and destroy organic contaminants.	<p><b>Applicability.</b> Chemical oxidation commonly applied to wide range of organic compounds including unsaturated aliphatic (i.e., TCE), aromatic compounds (i.e., benzene), and fuel hydrocarbons. Fast reaction rates can be achieved depending on oxidant type used.</p> <p><b>Limitations.</b> Incomplete oxidation can result in intermediate contaminants. Some oxidizers can be explosive, particularly in high concentrations of high energy contaminants. Uniform application of oxidants required to ensure all contaminants are being treated can be difficult to achieve in stratified soils. Indiscriminant and rapid reactions with other oxidant-consuming substances (e.g., natural organic matter) reduce effectiveness.</p>	<p><b>Medium</b></p> <p>Heavier motor oil range TPH contaminants are amendable to treatment using chemical oxidation, but can require higher chemical dosing rates compared to lighter TPH compounds. Low soil permeability from silts and clays will make uniform distribution of the chemical oxidizer within the subsurface more difficult although relatively shallow and thin treatment zone will help this. Also, high contaminant concentrations and/or free phase product could require large amount of oxidizer.</p>	<p><b>Moderately Difficult</b></p> <p>After all aboveground structures are removed, injecting the oxidants would not be difficult, although effective distribution of oxidants through treatment zone may be challenging. Handling large quantities of strong oxidizers presents health and safety concerns.</p>	<p><b>Medium to High④</b></p> <p>Costs dependent on contaminant concentrations. High concentrations and the potential presence of free phase product could require large quantities and frequent applications of the oxidizer and result in much higher costs. Less contaminated soils will require less oxidant, fewer applications, and would cost less. Handling and safety requirements add additional costs. The uncertainty is moderate to high since the stratified lithology and low soil permeability could prevent oxidant from being uniformly distributed within the contaminated regions – treatability studies would be required to address uncertainty.</p>	Yes – although site soils not well suited for in situ approach, chemical oxidation retained as representative <i>in situ</i> remediation technology. May not be appropriate for treating source area soils.
<i>In Situ</i> Soil Washing	Water, or water containing an additive to enhance contaminant mobility, is applied to the soil surface or injected into the ground to flush contaminants into the groundwater. The groundwater is then extracted and treated.	<p><b>Applicability.</b> Soil washing can be used to treat VOCs, SVOCs, and some fuels and enhance recovery of NAPL.</p> <p><b>Limitations.</b> Different contaminants require different wash water mixtures. Clayey soil causes the contaminant to adhere more strongly to the soil, making it difficult to desorb. Also, the wash water may alter the physical and chemical properties of soil.</p>	<p><b>Low</b></p> <p>Contaminants are hydrophobic and soil washing would not mobilize the contaminants to the water table. Amendments may help, but there is significant uncertainty as to effectiveness. Soil washing could also result in contaminating previously clean areas.</p>	<p><b>Moderately Difficult</b></p> <p>Implementation requires uniform application of water and amendments through the contaminated region, which would be difficult given stratified and low-permeability soils.</p>	<p><b>Low to Medium⑤</b></p> <p>This technology involves a low-cost network of aboveground piping and systems to inject the wash water. The high uncertainty is a result of the stratified lithology, low soil permeability, and hydrophobic contaminants.</p>	No – effectiveness uncertain

Table 36a  
Preliminary Screening of Remedial Technologies for Soil  
Napa Pipe Facility, Napa, California

Technology	Description	General Applicability/Limitations	Comments Specific to Other Areas			Retained?
			Effectiveness <sup>a</sup>	Implementability <sup>b</sup>	Relative Cost <sup>c</sup>	
Off-Site Disposal	Excavated soil is disposed off-site at an approved and permitted facility.	<b>Applicability.</b> Off-site disposal facilities are readily available that accept soils contaminated with fuels and VOCs.  <b>Limitations.</b> None.	<b>High</b> Impacted soil is removed and no longer provides a potential source of contamination to groundwater.	<b>Easy</b> Off-site disposal facilities readily available and only require transportation of contaminated soils.	<b>Moderate to High ①</b> Costs for off-site disposal are moderate to high depending on waste classification of soils. Costs further increased due to need for importing of additional fill to site. Low uncertainty.	Yes – retained for use with soils that may not be amenable for treatment with on-site technologies.
NOTE: Uncertainty rating reflects additional data needs or technology development needed to demonstrate applicability, implementability, and cost uncertainty. ① = low degree of uncertainty. Site data generally available to determine applicability. ⑤ = high degree of uncertainty. Additional data, <sup>a</sup> Preliminary effectiveness ratings of high, medium, and low reflect estimated relative effectiveness of the technology to treat the site contaminants and meet RAOs. <sup>b</sup> Implementability rating of easy, moderately easy, moderately difficult, and difficult reflect estimated relative complexity and cost of implementing the technology. <sup>c</sup> Cost reflects the relative overall costs (low, medium, high) of implementing the technology at the site.						

Table 36b  
Preliminary Screening of Remedial Technologies for Groundwater  
Napa Pipe Facility, Napa, California

Technology	Description	General Applicability/Limitations	Comments Specific to Other Areas			Retained?
			Effectiveness <sup>a</sup>	Implementability <sup>b</sup>	Relative Cost <sup>c</sup>	
Groundwater Extraction	Groundwater is pumped to extract contaminants and generate hydraulic gradients that can contain the plume and mobilize the contaminants to the extraction wells. Extracted groundwater is treated aboveground as needed and discharged.	<p><b>Applicability.</b> Groundwater pumping is common for achieving hydraulic control and recovering contaminant mass. The contaminants are removed from the subsurface in the dissolved phase and then removed by the carbon. Technology is applicable to high contaminant concentrations in the dissolved phase in soils with high permeability and yields.</p> <p><b>Limitations.</b> Groundwater extraction for contaminant removal is dependent on the hydraulic permeability of the formation.</p>	<p><b>Low</b></p> <p>Given low permeability and stratified soils at the Site, achieving cleanup goals with groundwater extraction will be slow and may not affect residual free phase product (light or dense).</p>	<p><b>Easy</b></p> <p>Groundwater extraction involves installing pumping systems to remove groundwater from the subsurface. These systems are relatively easy to install and operate. The required skills and experience for this technology is widely available. There are numerous vendors that can supply the equipment.</p>	<p><b>Medium to High ⑤</b></p> <p>System installation costs are not excessive. Due to long cleanup timeframe, however, life-cycle costs for groundwater extraction and treatment systems are often high. Treatment costs could be high due to potentially significant contaminant mass. There is a high uncertainty regarding the timeframe required to achieve cleanup goals, if they can be achieved with this technology at all.</p>	No – low effectiveness due to site conditions (presence of free-phase product) and inability to meet RAOs.
Existing Wastewater Treatment System and Sanitary Sewer Discharge	The Napa Pipe facility currently maintains a wastewater treatment system that discharges into the sanitary sewer under a permit with the Napa County Sanitation District. This system includes storage tanks, chemical injection systems (flocculant injection), settling tanks, an oil/water separator. Groundwater generated during dewatering will be treated using this existing wastewater treatment system and discharged to the sanitary sewer under the existing permit. If additional treatment is required to remove dissolved organic constituents (TPH, VOCs) to below permit limits, a series of granular activated carbon (GAC) vessels will be added as a polishing step prior to discharge.	<p><b>Applicability.</b> The existing wastewater treatment system appears to be suitable for use in treating groundwater with only minimal modification required, including the potential addition of GAC vessels to remove dissolved organics.</p> <p><b>Limitations.</b> The existing wastewater treatment system must be operated within the requirements of the sanitary sewer discharge permit. Temporary transfer piping may be required to get groundwater from remediation areas to the system, or it can be moved using portable tanks or tanker trucks.</p>	<p><b>High</b></p> <p>The existing system has been demonstrated effective at meeting discharge requirements for the sanitary sewer and has the major treatment components needed to be treat groundwater, with the possible addition of GAC vessels.</p>	<p><b>Easy</b></p> <p>The existing facility is already constructed and permitted, and modifications necessary for use in treating groundwater are relatively straightforward to implement.</p>	<p><b>Low ③</b></p> <p>The existing system will cost very little to modify for use as a groundwater treatment system, and operational costs are expected to be moderate. Uncertainty is associated with need to determine whether GAC adsorption vessels will be required and the means in getting the groundwater to the system.</p>	Yes – will be effective in managing groundwater extracted as part of excavation dewatering activities.
Permeable Reactive Barrier	Subsurface barrier allows passage of groundwater and controls movement of contaminants. The barrier is filled with reactive agents or microorganisms where the concentrated contaminants are either degraded or retained in the barrier material.	<p><b>Applicability.</b> Reactive barriers apply to VOCs, SVOCs, and inorganics. A variety of media have been used to treat various classes of contaminants.</p> <p><b>Limitations.</b> Requires heavy construction equipment. The reactive agents must be matched to the contaminants. Effectiveness is specific to barrier media and contaminants. Needs to be keyed into a confining layer. Barriers can lose hydraulic or reactive capacity over time. May be susceptible to fouling or excessive leakage if not designed and/or installed properly.</p>	<p><b>Low</b></p> <p>At the site, with the low groundwater flowrates, there may be limited effectiveness in achieving cleanup goals. Contaminant mass removal is a function of the flowrates through the wall. Unlikely to have efficiency for TPH compounds dissolved in groundwater.</p>	<p><b>Moderately Difficult</b></p> <p>Because of the shallow water table and relatively shallow depth to confining layer, installing the slurry wall barrier is straightforward. However, the extent of the contaminant boundary requires a large area to be contained and the plume would need to be more clearly delineated.</p>	<p><b>Medium to High ③</b></p> <p>This technology involves excavating a large quantity of soil, but significantly less than the entire contaminated volume. Additional costs would be incurred. The medium uncertainty is associated with the determining the nature of the permeable barrier and evaluating the site hydraulics to effectively design the slurry wall/barrier system.</p>	No – not effective given site conditions and TPH contaminants.

**Table 36b**  
**Preliminary Screening of Remedial Technologies for Groundwater**  
**Napa Pipe Facility, Napa, California**

Technology	Description	General Applicability/Limitations	Comments Specific to Other Areas			Retained?
			Effectiveness <sup>a</sup>	Implementability <sup>b</sup>	Relative Cost <sup>c</sup>	
<i>In Situ</i> Enhanced Bioremediation	<p>Adding oxygen, nutrients, co-substrates, or amendments to the groundwater to increase the rate of biodegradation.</p> <p>Can also implement this technology by applying amendments to open excavations during backfilling for treatment of residual contamination.</p>	<p><b>Applicability.</b> Bioremediation is applicable to petroleum hydrocarbons, some solvents, and other organic chemicals. Can be effective for remediating low level residual contamination in conjunction with source removal.</p> <p><b>Limitations.</b> Applies to contaminants that can be biodegraded. Low permeability soils can hinder contact between contaminant, oxygen, and applied nutrients. Bio-fouling can result from biomass accumulation on well screens. Too low or too high contaminant concentrations adversely affect biodegradation rates.</p>	<p><b>Medium</b></p> <p>Could enhance aerobic degradation in areas with lower contaminant concentrations. Potential for free product and high contaminant concentrations in source areas may be too toxic for effective biodegradation. Can be effective in controlling residual contamination in excavations by adding amendments to backfill in the saturated zone.</p>	<p><b>Moderately Easy</b></p> <p>Implementing this technology is fairly easy, and skills, experience and equipment requirements are minimal. However, ensuring uniform application throughout the subsurface may be problematic due to the silty and clayey soils. This could result in hot spots continuing to contaminate the groundwater. Implementation as a backfill amendment is very simple.</p>	<p><b>Low ④</b></p> <p>Adding oxygen, nutrients, and amendments to the subsurface involves easy-to-operate and fairly common equipment. Moderate uncertainty associated with need to determine nature of amendments through treatability studies and uncertainty related to timeframe for achieving cleanup goals. Also, stratified lithology/ low permeability soils may prevent complete contact with all contaminant mass.</p>	<p>Yes – may be cost effective for lower concentration groundwater plumes but would require treatability studies to evaluate further.</p>
Monitored Natural Attenuation	<p>Natural processes (volatilization, biodegradation, adsorption, and chemical reactions) are used to reduce contaminant concentrations to acceptable levels.</p>	<p><b>Applicability.</b> Natural attenuation is a common element of cleanup programs for fuel hydrocarbons and halogenated VOCs. Can be used to manage residual contamination following site stabilization and source control activities.</p> <p><b>Limitations.</b> Extensive site characterization, modeling, and monitoring are required to document the natural attenuation of the contaminants. Typically involves long cleanup timeframe. High contaminant concentrations and/or free phase product limit applicability of biodegradation. Similarly, higher molecular weight contaminants hinder volatilization.</p>	<p><b>Low</b></p> <p>As compared to other remedial technologies, use of MNA will result in an extended cleanup timeframe. Diesel and motor oil are not amenable to volatilization, and areas of high concentrations and/or free phase product will be toxic to the bacteria.</p>	<p><b>Easy</b></p> <p>The skills and experience to implement monitored natural attenuation is minimal. Sampling and analysis are needed to baseline the process and monitor ongoing progress.</p>	<p><b>Low to Medium⑤</b></p> <p>Because there are no major equipment and construction requirements, the cost to implement this technology is low, although long-term monitoring costs can be significant. The uncertainty of achieving the RAOs is high since contaminant concentrations have remained high after many years of potential bioactivity. High concentrations and free product inhibit natural biodegradation, and the site contaminants are not amenable to natural volatilization.</p>	<p>No –not effective in achieving cleanup goals in reasonable timeframe.</p>
Air Sparging	<p>Air is injected into groundwater to volatilize contaminants, and oxygen potentially increases biodegradation rates. Contaminants sparged from groundwater are recovered in the unsaturated zone by SVE.</p>	<p><b>Applicability.</b> Target contaminants for sparging include VOCs and volatile fuels. Removal mechanisms can include volatilization and enhanced bioremediation.</p> <p><b>Limitations.</b> Non-volatile contaminants not removed with this technology. Effectiveness requires uniform flow of air through saturated soil. Heterogeneous soils can result in non-uniform treatment and uncontrolled movement of contaminated vapors. High contaminant solubility limits transfer to the vapor phase. Addition of oxygen could cause oxidation and precipitation of iron and impact air permeability.</p>	<p><b>Low</b></p> <p>Diesel and motor oil are not readily amenable to this technology with lower volatilization rate. Silts and clays result in areas of low permeability, adversely affecting air flowrates. High contaminant concentrations and/or free phase product increase the potential for spreading contamination into previously clean areas.</p>	<p><b>Easy</b></p> <p>Equipment to implement this technology is readily available and easy to operate. Similarly, the necessary skills and experience are minimal.</p>	<p><b>Medium ④</b></p> <p>Air sparging equipment costs are relatively low due to minimal equipment, although operating costs would add to the total cost. The uncertainty is high due to low air permeability, high contaminant concentrations, and unknown design parameters. Site lithology not conducive to technologies relying on subsurface air flow.</p>	<p>No – technology ineffective with heavier contaminants and not suited to soil conditions.</p>

Table 36b  
Preliminary Screening of Remedial Technologies for Groundwater  
Napa Pipe Facility, Napa, California

Technology	Description	General Applicability/Limitations	Comments Specific to Other Areas			Retained?
			Effectiveness <sup>a</sup>	Implementability <sup>b</sup>	Relative Cost <sup>c</sup>	
Thermally Enhanced Air Sparging	Hot air, steam, or electric heating is used to enhance desorption and volatilization of the contaminants. Other potential benefits are increased contaminant mobility and biodegradation rates.	<p><b>Applicability.</b> Heating improves the volatility of VOCs and SVOCs. Effective for subsurfaces with higher air permeability.</p> <p><b>Limitations.</b> Performance is function of attainable temperature, air permeability, and contaminant volatility. Off-gas and residual liquids may be required treatment/disposal. Higher process temperatures require specialized equipment. Shallow water tables may allow contaminated vapors to escape.</p>	<p><b>Medium</b></p> <p>Thermal enhancement may improve volatilization. Diesel and motor oil contaminants will volatilize more when heated. Maximum groundwater temperatures are limited by low air permeability and shallow water table. Stratified lithology may result in cold spots where contaminants are not treated, thereby continuing to contaminate the groundwater above RAO requirements.</p>	<p><b>Moderately Difficult</b></p> <p>Similar to air sparging except process equipment rated for higher temperature may be needed. Also, specialized skills are required to operate and maintain the heat source systems. Vapor control becomes a challenge to ensure contaminated vapors and liquids do not contaminate previously clean areas.</p>	<p><b>Medium to High⑤</b></p> <p>Costs are higher than conventional air sparging due to need for high temperature rated equipment and material. Also, electrical and/or fuel costs are significantly higher to supply the heat source. Shallow water table may require additional measures to ensure contaminated vapors are not released from the site. Maximum soil temperatures are limited by low air permeability and shallow water table. High uncertainty since no data is available to determine long-term effectiveness and remediation duration. Site lithology not conducive to technologies relying</p>	No – technology likely ineffective due to soil conditions
In Well Vapor Stripping	In this technology, a groundwater circulation cell is created around a circulation well. Contaminated groundwater is cycled through lower and upper screened intervals. The lower screened interval is below the water table, and the upper screened interval is across or above the water table. This causes the water to aerated as it discharges into the unsaturated zone, causing contaminants to volatilize.	<p><b>Applicability.</b> Air stripping is applicable to VOCs with Henry's law constant greater than 0.01 or vapor pressure greater than 0.5 mm Hg. Some compounds that have been successfully separated from water using air stripping include BTEX, chloroethane, TCE, vinyl chloride, DCE, and PCE.</p> <p><b>Limitations.</b> High solubility, low Henry's constant, and low permeability reduce the overall effectiveness. High iron and hardness or biomass accumulation can cause operational problems and reduce efficiency or require pretreatment. Similarly, presence of free phase product will coat the circulation well and significantly decrease performance.</p>	<p><b>Low</b></p> <p>For stripping, diesel and motor oil are not readily amenable for air stripping with low volatilization rates. Silts and clays and stratified lithology result in areas of low permeability, adversely vertical flow of groundwater through subsurface.</p>	<p><b>Moderately Difficult</b></p> <p>The shallow water table makes this an easy technology to implement. With the confining layer close to the water table, short-circuiting may occur.</p>	<p><b>Medium ④</b></p> <p>Costs are moderate because although readily available conventional equipment is used, shallow groundwater zone being treated would require numerous wells. The uncertainty is high due to soil conditions and since the contaminants are not amenable to vapor phase partitioning.</p>	No – not effective with site contaminants or soil conditions.

Table 36b  
Preliminary Screening of Remedial Technologies for Groundwater  
Napa Pipe Facility, Napa, California

Technology	Description	General Applicability/Limitations	Comments Specific to Other Areas			Retained?
			Effectiveness <sup>a</sup>	Implementability <sup>b</sup>	Relative Cost <sup>c</sup>	
<i>In Situ</i> Chemical Oxidation	Strong oxidizer is injected into subsurface to oxidize and destroy organic contaminants.	<b>Applicability.</b> Chemical oxidation commonly applied to wide range of organic compounds including unsaturated aliphatic (i.e., TCE), aromatic compounds (i.e., benzene), and fuel hydrocarbons. Fast reaction rates can be achieved depending on oxidant type used.  <b>Limitations.</b> Incomplete oxidation can result in intermediate contaminants. Uniform application of oxidants required to ensure all contaminants are being treated can be difficult to achieve in stratified soils. Indiscriminant and rapid reactions with other oxidant-consuming substances reduce effectiveness.	<b>Medium to High</b> Diesel and motor oil amendable to treatment using chemical oxidation. Effectiveness largely dependent on ability to distribute oxidant through target zone and low soil permeability from silts and clays will make uniform distribution of within the subsurface more difficult. Relatively shallow and thin treatment zone may help overcome this difficulty. Also, high contaminant concentrations and/or free phase product could require large amount of oxidizer.	<b>Moderately Difficult</b> After all aboveground structures are removed, injecting the oxidants would not be difficult, although effective distribution of oxidants through treatment zone may be challenging. Handling large quantities of strong oxidizers presents health and safety concerns.	<b>Medium ④</b> Costs dependent on contaminant concentrations. High concentrations and the potential presence of free phase product could require large quantities and frequent applications of the oxidizer and result in much higher costs. Handling and safety requirements add additional costs. The uncertainty is moderate to high since the stratified lithology and low soil permeability could prevent oxidant from being uniformly distributed within the contaminated regions – treatability studies would be required to address uncertainty.	Yes – although site soils not well suited for in situ approach, may be cost effective for lower concentration groundwater plumes.
Saturated Soil Excavation	The contaminated groundwater plume is physically removed by excavating the saturated soil within the groundwater plume boundaries. Excavated soil is managed on-site through treatment or other appropriate methods and used as fill.	<b>Applicability.</b> Excavation of soils below water table as a means of groundwater plume remediation is not a common approach, although shallow depth to water, relatively thin contaminated zone, and need for a short remediation timeframe may make it applicable at this site.  <b>Limitations.</b> Requires heavy construction equipment. Dewatering likely required as part of saturated zone excavation. Extent of excavation is fairly large to ensure removal of all contaminated material. Contaminant aeration is likely during excavation, potentially requiring respiratory protection for on-site workers.	<b>High</b> Impacted groundwater (and associated saturated soil) is physically removed and no longer provides a potential source of contamination to groundwater.	<b>Moderately Difficult</b> Although standard soil excavation techniques would likely be utilized, implementing this approach will be complicated by need for dewatering and by the relatively large area to be excavated.	<b>Medium ①</b> Large contaminated area may require dewatering and hydraulic control. Costs impacted by approach to managing soil and groundwater once excavated. Potential need to use respiratory equipment and possible exposure to contaminated soils and groundwater increase costs. Low uncertainty since all contaminants are excavated and confirmed via on-site sampling.	Yes – would quickly and effectively eliminate groundwater contamination
<p>NOTE: Uncertainty rating reflects additional data needs or technology development needed to demonstrate applicability, implementability, and cost uncertainty. ① = low degree of uncertainty. Site data generally available to determine applicability. ⑤ = high degree of uncertainty. Additional data, analysis, pilot testing, or technology development required to determine applicability to site.</p> <p><sup>a</sup> Preliminary effectiveness ratings of high, medium, and low reflect estimated relative effectiveness of the technology to treat the site contaminants and meet RAOs.</p> <p><sup>b</sup> Implementability rating of easy, moderately easy, moderately difficult, and difficult reflect estimated relative complexity and cost of implementing the technology.</p> <p><sup>c</sup> Cost reflects the relative overall costs (low, medium, high) of implementing the technology at the site.</p>						

**Table 37**  
**Estimated Capital and O&M Costs - Alternative 3**  
**Ex Situ Source Area Soil and Groundwater Treatment and In Situ Groundwater Plume Remediation**  
**Other Areas - Fabrication Building, Former Double-Ender Building,**  
**Former Internal Coatings Building, and Former Acid Drain Line**  
**Napa Pipe Facility, Napa, California**

Construction Costs							
ITEM	UNIT COST		UNITS	QUANTITY		COST	
	low	high		low	high	low	high
<b>Construction Costs</b>							
1. Mobilization/demobilization	\$ 25,000	\$ 50,000	LS	1	1	\$ 25,000	\$ 50,000
2. Excavate, stockpile, and replace clean overburden	\$ 11	\$ 14	CY	600	700	\$ 7,000	\$ 10,000
3. Excavate contaminated unsaturated soil >cleanup levels and stockpile for on-site treatment	\$ 4	\$ 7	CY	200	200	\$ 1,000	\$ 1,000
4. Excavate saturated source area soil >cleanup levels and stockpile for on-site treatment	\$ 6	\$ 9	CY	1,000	1,000	\$ 6,000	\$ 9,000
5. Excavation dewatering, treat groundwater on-site, and discharge to sewer	\$ 25,000	\$ 50,000	LS	1	1	\$ 25,000	\$ 50,000
6. Excavation and off-site disposal of metals-contaminated soil	\$ 110	\$ 130	CY	590	590	\$ 65,000	\$ 77,000
7. <i>In situ</i> treatment of area where groundwater >cleanup levels	\$ 25	\$ 35	CY	7,200	7,200	\$ 180,000	\$ 252,000
8. Amend excavation bottom prior to backfill	\$ 40,000	\$ 80,000	acre	0.1	0.2	\$ 4,000	\$ 16,000
9. Treatment of contaminated soil on-site							
- Move and replace untreated in commercial area (10% of volume)	\$ 9	\$ 12	CY	100	100	\$ 1,000	\$ 1,000
- Biopile Treatment (50% of total volume)	\$ 20	\$ 60	CY	600	600	\$ 12,000	\$ 36,000
- Low Temperature Thermal Desorption (30% of total volume)	\$ 40	\$ 75	CY	400	400	\$ 16,000	\$ 30,000
- Off-Site Disposal (10% of total volume)	\$ 60	\$ 90	CY	100	100	\$ 6,000	\$ 9,000
10. Installation of monitoring wells	\$ 20,000	\$ 40,000	LS	1	1	\$ 25,000	\$ 45,000
11. Confirmation soil/soil gas sampling	\$ 20,000	\$ 40,000	LS	1	1	\$ 20,000	\$ 40,000
Subtotal						\$ 393,000	\$ 626,000
Engineering and Permitting (15%)						\$ 59,000	\$ 94,000
Construction Cost Contingency (30%)						\$ 118,000	\$ 188,000
<b>Total Estimated Capital Costs</b>						<b>\$ 570,000</b>	<b>\$ 910,000</b>
<b>Average Capital Cost</b>						<b>\$ 740,000</b>	

Operation and Maintenance Costs		
Activity	Estimated Annual Cost	
	low	high
1. Confirmation Monitoring for <i>In Situ</i> Groundwater Treatment Area (assume 1 year)	\$ 40,000	\$ 75,000
2. Monitoring well abandonment	\$ 30,000	\$ 80,000
Subtotal		\$ 70,000
O&M Cost Contingency (20 %)		\$ 14,000
<b>Total Estimated O&amp;M Costs</b>		<b>\$ 84,000</b>
<b>Average O&amp;M Cost</b>		<b>\$ 135,000</b>
<b>TOTAL ESTIMATED COST</b>		<b>\$ 880,000</b>



**Table 38**  
**Estimated Capital and O&M Costs - Alternative 4**  
**Ex Situ Soil and Groundwater and Groundwater Remediation**  
**Other Areas - Fabrication Building, Former Double-Ender Building,**  
**Former Internal Coatings Building, and Former Acid Drain Line**  
**Napa Pipe Facility, Napa California**

Construction Costs							
ITEM	UNIT COST		UNITS	QUANTITY		COST	
	low	high		low	high	low	high
<b>Construction Costs</b>							
1. Mobilization/demobilization	\$ 25,000	\$ 50,000	LS	1	1	\$ 25,000	\$ 50,000
2. Excavate, stockpile, and replace clean overburden	\$ 11	\$ 14	CY	4,800	4,800	\$ 53,000	\$ 67,000
3. Excavate unsaturated and saturated soil >cleanup levels and stockpile for on-site treatment	\$ 4	\$ 7	CY	1,200	1,200	\$ 5,000	\$ 8,000
4. Excavate soil in area where groundwater >cleanup levels	\$ 6	\$ 9	CY	7,200	7,200	\$ 43,000	\$ 65,000
5. Excavation and off-site disposal of metals-contaminated soil	\$ 110	\$ 130	CY	590	590	\$ 65,000	\$ 77,000
6. Pump groundwater from excavations, treat on-site, and discharge to sewer	\$ 50,000	\$ 100,000	LS	1	1	\$ 50,000	\$ 100,000
7. Amend excavation bottom prior to backfill	\$ 40,000	\$ 80,000	acre	0.8	1.0	\$ 32,000	\$ 80,000
8. Treatment of contaminated soil on-site (with other soils)							
- Move and replace untreated in commercial area (49% of volume)	\$ 9	\$ 12	CY	4,100	4,100	\$ 37,000	\$ 49,000
- Biopile Treatment (28% of total volume)	\$ 20	\$ 60	CY	2,400	2,400	\$ 48,000	\$ 144,000
- Low Temperature Thermal Desorption (17% of total volume)	\$ 40	\$ 75	CY	1,400	1,400	\$ 56,000	\$ 105,000
- Off-Site Disposal (6% of total volume)	\$ 60	\$ 90	CY	500	500	\$ 30,000	\$ 45,000
9. Confirmation groundwater sampling (Geoprobe)	\$ 20,000	\$ 40,000	LS	1	1	\$ 20,000	\$ 40,000
10. Confirmation soil/soil gas sampling	\$ 30,000	\$ 50,000	LS	1	1	\$ 30,000	\$ 50,000
Subtotal						\$ 494,000	\$ 880,000
Engineering and Permitting (15%)						\$ 74,000	\$ 132,000
Construction Cost Contingency (30%)						\$ 148,000	\$ 264,000
<b>Total Estimated Capital Costs</b>						<b>\$ 720,000</b>	<b>\$ 1,280,000</b>
<b>Average Capital Cost</b>						<b>\$ 1,000,000</b>	

Table 39  
Evaluation of Remedial Alternatives  
Other Areas - Fabrication Building, Former Double-Ender Building, Former Internal Coatings Building, and Former Acid Drain Line  
Napa Pipe Facility  
Napa, California

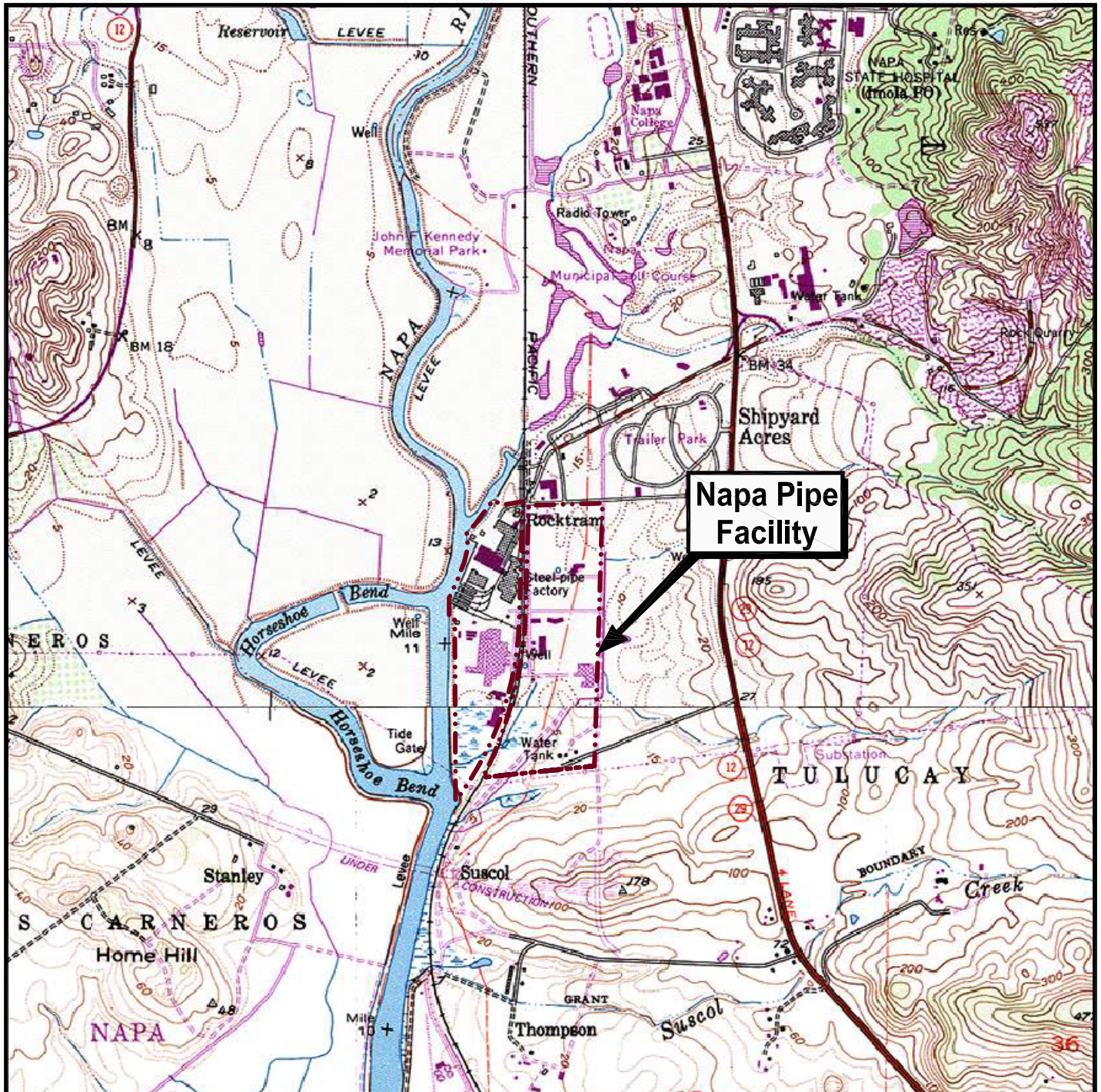
	Remedial Alternatives				
Evaluation Criteria	Alternative 1 - No Action	Alternative 2 - Groundwater Monitoring	Alternative 3 - <i>Ex Situ</i> Source Area Treatment with <i>In Situ</i> Groundwater Remediation	Alternative 4 - <i>Ex Situ</i> Soil and Groundwater Remediation	Comparison of Alternatives
NCP Threshold Criteria					
Overall Protection of Human Health and the Environment	Not protective. Would leave COCs in place above cleanup levels in both soil and groundwater.	Would require long-term institutional and engineering controls to be protective. Would leave COCs in place above residential-based cleanup levels in both soil and groundwater.	By reducing COCs to below the risk-based cleanup levels, human health and the environment would be protected.	By excavating soil and groundwater with COCs above cleanup levels and treating this soil and groundwater to below the risk-based cleanup levels, Alternative 4 would be protective of human health and the environment.	Alternatives 1 and 2 are not protective of human health and the environment. Both Alternatives 3 and 4 appear to offer similar high levels of protectiveness through aggressive treatment of contaminants.
Compliance With ARARs	Would not comply with ARARs related to protection of human health.	Would comply with some ARARs, but would require long-term institutional and engineering controls.	Alternative 3 is expected to comply with the applicable ARARs. Contaminant levels in soil and groundwater would be reduced to below cleanup level TBCs (ESLs) and treatment technologies would be designed and implemented in compliance with applicable regulations and permit requirements.	Alternative 4 is expected to comply with applicable ARARs. Contaminated soil and groundwater would be excavated and treated to below cleanup level TBCs (ESLs) and treatment technologies would be designed and implemented in compliance with applicable regulations and permit requirements.	Alternative 1 would not comply with ARARs. Alternative 2 would comply with the few applicable ARARs, but only through extensive use of institutional and engineering controls. Alternatives 3 and 4 would comply with ARARs to essentially the same degree.
NCP Primary Balancing Criteria					
Long-Term Effectiveness	Ineffective in the long-term as alternative does not achieve, nor maintain, protection of human health and the environment.	Ineffective in the long-term as alternative does not achieve cleanup levels in all but the longest term and requires institutional and engineering controls to maintain protection of human health and the environment.	Through a combination of excavating with <i>ex situ</i> treatment and <i>in situ</i> chemical oxidation, Alternative 3 would permanently reduce contaminant concentrations to below cleanup levels and would therefore be very effective in the long-term.	By excavating soil and groundwater exceeding ESLs and treating them <i>ex situ</i> to destroy the contaminants, Alternative 4 would permanently reduce contaminant concentrations to below cleanup levels and therefore would be very effective in the long-term.	Alternatives 1 and 2 would not be effective in the long-term. By significantly reducing contaminant concentrations in soil and groundwater, both Alternatives 3 and 4 would be effective in the long-term. By relying solely on excavation to remove contaminants from the subsurface, Alternative 4 would appear to achieve this with a higher degree of certainty as compared to Alternative 3 which uses <i>in situ</i> treatment.
Reduction of Mobility, Toxicity, Volume	Alternative 1 does not achieve reduction in contaminant mobility, toxicity, or volume.	Because Alternative 2 only includes groundwater monitoring, there will no reduction in contaminant mobility, toxicity, or volume.	The mobility, toxicity, and volume of contaminants would be effectively and significantly reduced through the use of treatment technologies in Alternative 3. The majority of the contaminant mass would be excavated and managed <i>ex situ</i> , thereby effectively eliminating the majority of contaminants from the subsurface. The remaining contaminants present in excess of cleanup levels would be treated <i>in situ</i> to below cleanup levels.	Alternative 4 would significantly reduce the mobility, toxicity, and volume of contaminants through the use of excavation and treatment. This approach would effectively eliminate the majority of contaminants from the subsurface.	Alternative 1 would not reduce contaminant mobility, toxicity, and volume. Over the long-term, Alternative 2 would not achieve reduction in contaminant mobility, toxicity, and volume, and would not address soil contamination. Both Alternative 3 and 4 would provide significant reductions through treatment, although Alternative 4 may achieve this more reliably compared to Alternative 3, as noted above.
Short-Term Effectiveness	Because there are no remedial activities to be implemented or constructed, there are very few short-term risks with this alternative, although the existing risks to human health and the environment due to elevated contaminant concentrations will remain.	There are few short-term risks with this alternative, although the existing risks to human health and the environment due to elevated contaminant concentrations will remain.	There are several potential short-term risks associated with implementing Alternative 3 that would need to be managed to maintain worker health and safety including risks associated with heavy excavation and earthmoving equipment, handling the chemical oxidants, potential vapors present during excavation and treatment operations, and risks related to the <i>ex situ</i> treatment technologies (e.g., LTTD). These risks can be effectively mitigated through careful design, appropriate use of health and safety procedures, personal protective equipment, and engineering controls during implementation.	As with Alternative 3, there are several potential short-term risks associated with implementing Alternative 4. These include risks associated with heavy excavation and earthmoving equipment, potential vapors present during excavation and treatment operations, and risks related to the <i>ex situ</i> treatment technologies (e.g., LTTD). These risks can be effectively mitigated through careful design, appropriate use of health and safety procedures, personal protective equipment, and engineering controls during implementation.	Alternatives 1 and 2 would have few if any short-term risks associated with their implementation. Both Alternatives 3 and 4 would have short-term implementation risks, but in general these are common construction-related concerns encountered at environmental remediation sites and would be easily mitigated through careful design and use of appropriate health and safety procedures. Alternative 3 may have a slightly higher short-term risk due to the use of large quantities of chemical oxidants for the <i>in situ</i> treatment component of this alternative.

Table 39  
Evaluation of Remedial Alternatives  
Other Areas - Fabrication Building, Former Double-Ender Building, Former Internal Coatings Building, and Former Acid Drain Line  
Napa Pipe Facility  
Napa, California

Evaluation Criteria	Remedial Alternatives				Comparison of Alternatives
	Alternative 1 - No Action	Alternative 2 - Groundwater Monitoring	Alternative 3 - <i>Ex Situ</i> Source Area Treatment with <i>In Situ</i> Groundwater Remediation	Alternative 4 - <i>Ex Situ</i> Soil and Groundwater Remediation	
Implementability	The no action alternative is technically implementable, but because it is not protective and does not comply with ARARs, it is not administratively implementable.	Alternative 2 is technically implementable, but because in the long-term it would not comply with ARARs or be protective it is not likely to be an administratively implementable alternative.	The technologies utilized in Alternative 3 are generally well established and proven technologies. There are, however, implementability issues that need to be addressed to ensure the effectiveness of the remedial activities. Most notable of these are the issues related to <i>in situ</i> chemical oxidation, specifically potential problems with uniformly distributing the oxidant blend throughout the fine-grained soils of the treatment zone. Treatability studies would be performed to develop the appropriate injection approach and spacing and the correct oxidant dosing. Other less significant implementability issues include treatability studies for <i>ex situ</i> biological treatment and conducting significant excavations below the water table; these potential issues can be addressed during the design process. Administratively, the most significant implementability issues would likely be permitting requirements associated with the <i>ex situ</i> treatment technologies, most importantly the air permitting requirements for the low temperature thermal desorption unit.	Alternative 4 utilizes well established construction and treatment technologies with relative few implementability issues including: the need to conduct treatability studies to establish the design parameters for <i>ex situ</i> biological treatment and procedures for conducting significant excavations below the water table. These potential issues can be addressed during the design process and should not pose significant problems for implementation of Alternative 4. Permitting requirements for the soil treatment technologies, especially the air permitting requirements for the low temperature thermal desorption unit present the most significant administrative implementability concerns.	Although Alternatives 1 and 2 are technically implementable they would not be administratively implementable. The excavation and <i>ex situ</i> components of Alternatives 3 and 4 would utilize the same construction and treatment technologies and therefore this aspect of these alternatives have identical implementability. The <i>in situ</i> component of Alternative 3 would present some potentially more significant implementability issues related to the difficulties in uniformly distributing the oxidant blend throughout the treatment zone, especially given the low permeability soils present at the Site. Bench and pilot scale treatability studies would help address this concern, but even then this aspect of Alternative 3 would make it's implementation somewhat less certain compared to Alternative 4. Administratively, the main issue for Alternatives 3 and 4 would be permitting requirements associated with the soil and groundwater treatment technologies, especially the LTTD unit.
Cost	There is little to no costs associated with the no action alternative.	Groundwater monitoring well installation and long-term monitoring for 20 years would have a net present value cost approximately \$710,000.	Average estimated capital costs for Alternative 3 are \$740,000 and O&M costs consisting of an estimated one year of groundwater monitoring and well abandonment total \$135,000. The total estimated cost of this alternative is \$880,000.	Average estimated capital costs for Alternative 4 are \$1.0 million. There are no O&M costs. The total estimated cost of this alternative is \$1.0 million.	Alternative 1 is by far the least costly, but does not achieve the comparison criteria or remedial objectives. Alternative 2, which only involves establishing a monitoring system, would have a net present value cost of \$710,000. Within the accuracy of these cost estimates, Alternatives 3 and 4 have essentially the same cost, with Alternative 3 having an estimated cost of approximately \$880,000, while Alternative 4 has an estimate cost of \$1.0 million.
NCP Modifying Criteria					
State Acceptance	Would not likely be accepted by State regulatory agencies (with residential development).	Would not likely be accepted by State regulatory agency (with residential development).	Given the protectiveness that would be achieved almost exclusively through contaminant treatment, it is expected that State agencies would accept this alternative.	Given the protectiveness that would be achieved almost exclusively through contaminant treatment, it is expected that State agencies would accept this alternative.	Alternatives 1 and 2 would not likely be acceptable to the State; they would not be protective nor comply with one or more of the applicable regulatory requirements. Given the protectiveness that would be achieved almost exclusively through contaminant treatment, both Alternatives 3 and 4 would likely be acceptable to the State. Specific concerns could be addressed during the remedial design process.
Community Acceptance	Would not likely be accepted by public (with residential development).	Would not likely be accepted by public (with residential development).	Assuming that the short-term risks identified above can be addressed, it is anticipated that the community would accept this alternative due to its high level of protectiveness and permanence.	Potentially more acceptable to the community because all of the contaminants exceeding cleanup levels are removed and treated elsewhere instead of a portion of them being treated <i>in situ</i> .	Alternatives 1 and 2 would not likely be acceptable to the public. Alternatives 3 and 4 are anticipated to both be acceptable to the public given the aggressive approach to treating the contaminants and the cleanup levels achieved. Specific implementability concerns could be addressed during the remedial design process.
Summary of Evaluation for Alternatives	The no action alternative does not meet the NCP threshold, primary balancing, or modifying criteria.	Alternative 2 does not meet the NCP threshold, primary balancing, or modifying criteria.	Alternative 3 will meet both the threshold NCP requirements as well as most if not all of the balancing and modifying criteria. The one possible exception is the implementability concerns related to the <i>in situ</i> chemical oxidation. Treatability studies can be conducted to help address these concerns.	Alternative 4 appears to meet all of the NCP criteria with a high degree of certainty.	

## **ILLUSTRATIONS**





--- Boundary of Napa Pipe Facility

0 2000 4000  
Scale In Feet



U.S.G.S. Topo Map - Napa, California, 7.5-minute quadrangle. Map version 1978; current as of 1980.  
U.S.G.S. Topo Map - Cuttings Wharf, California, 7.5-minute quadrangle. Map version 1978; current as of 1981.



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**Facility Location Map**  
Napa Pipe Facility  
1025 Kaiser Road  
Napa, California

PLATE

**1**



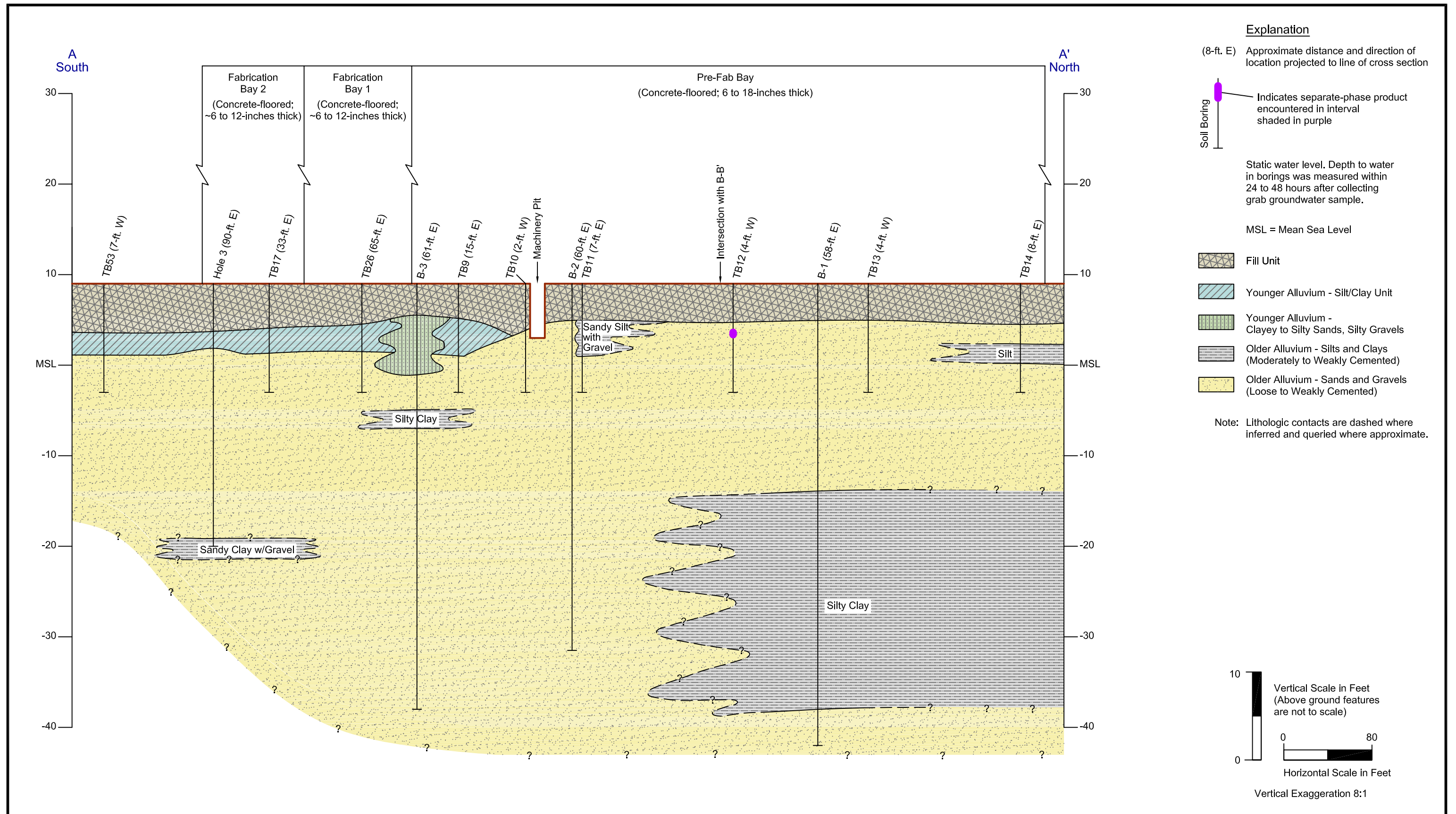


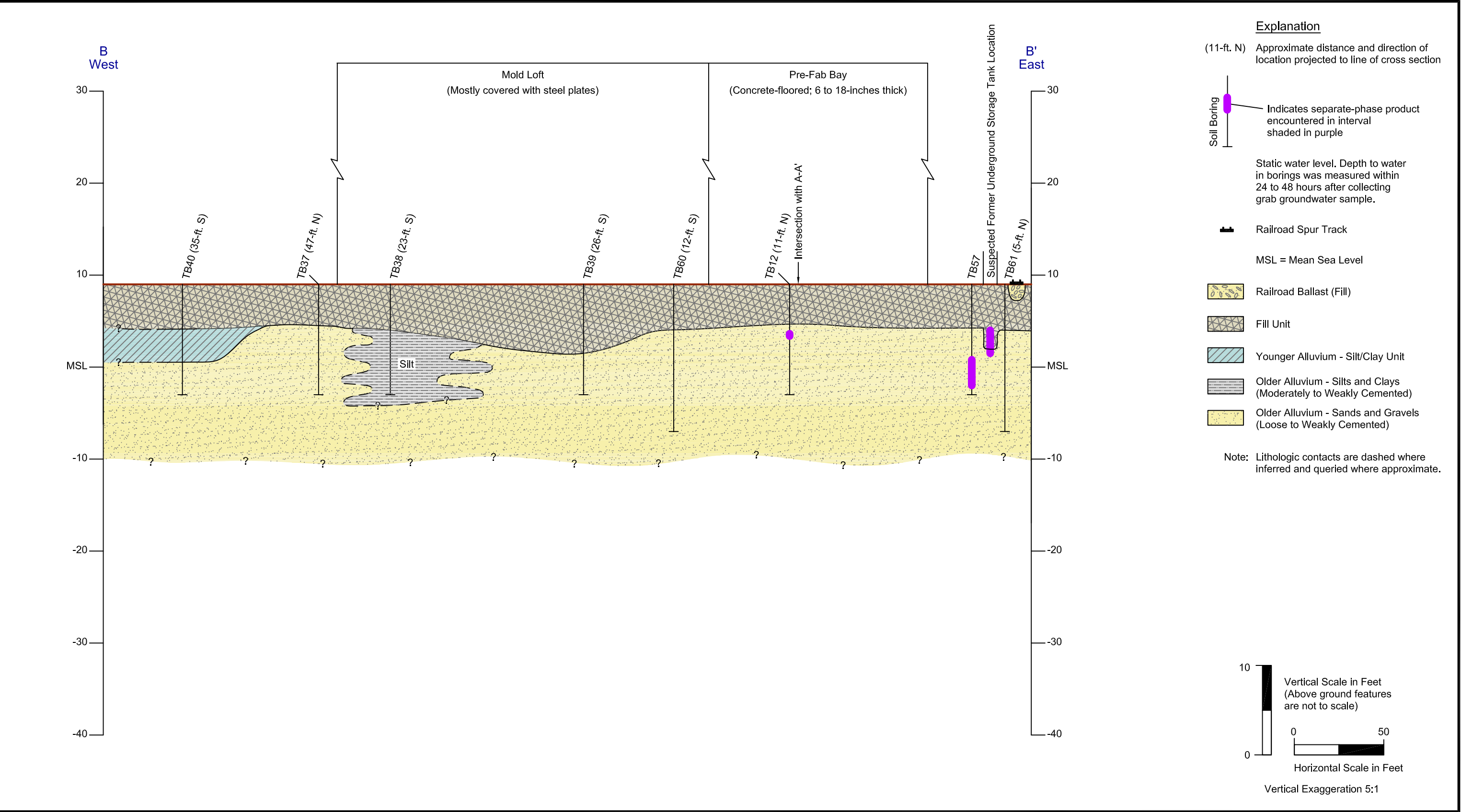










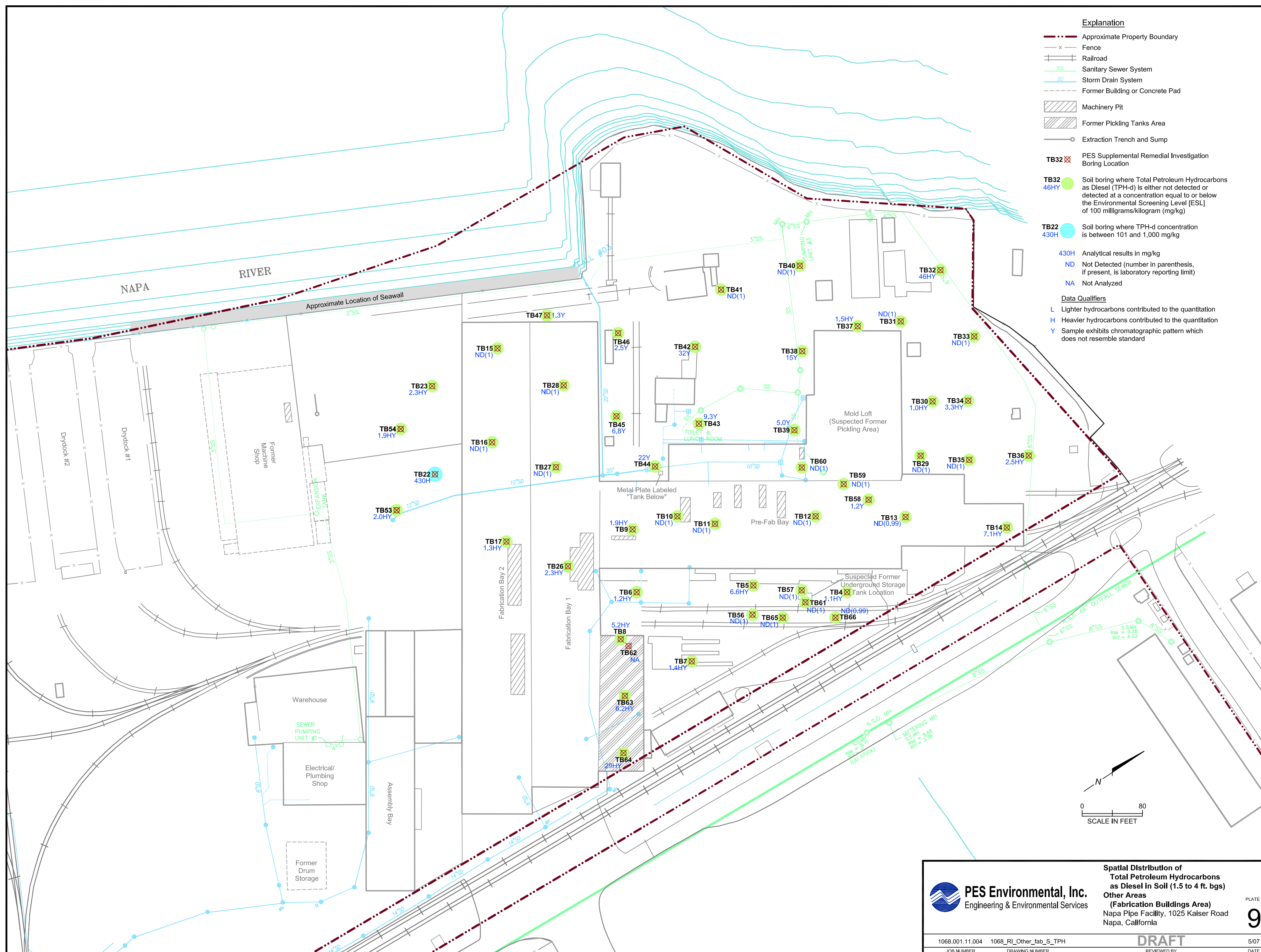




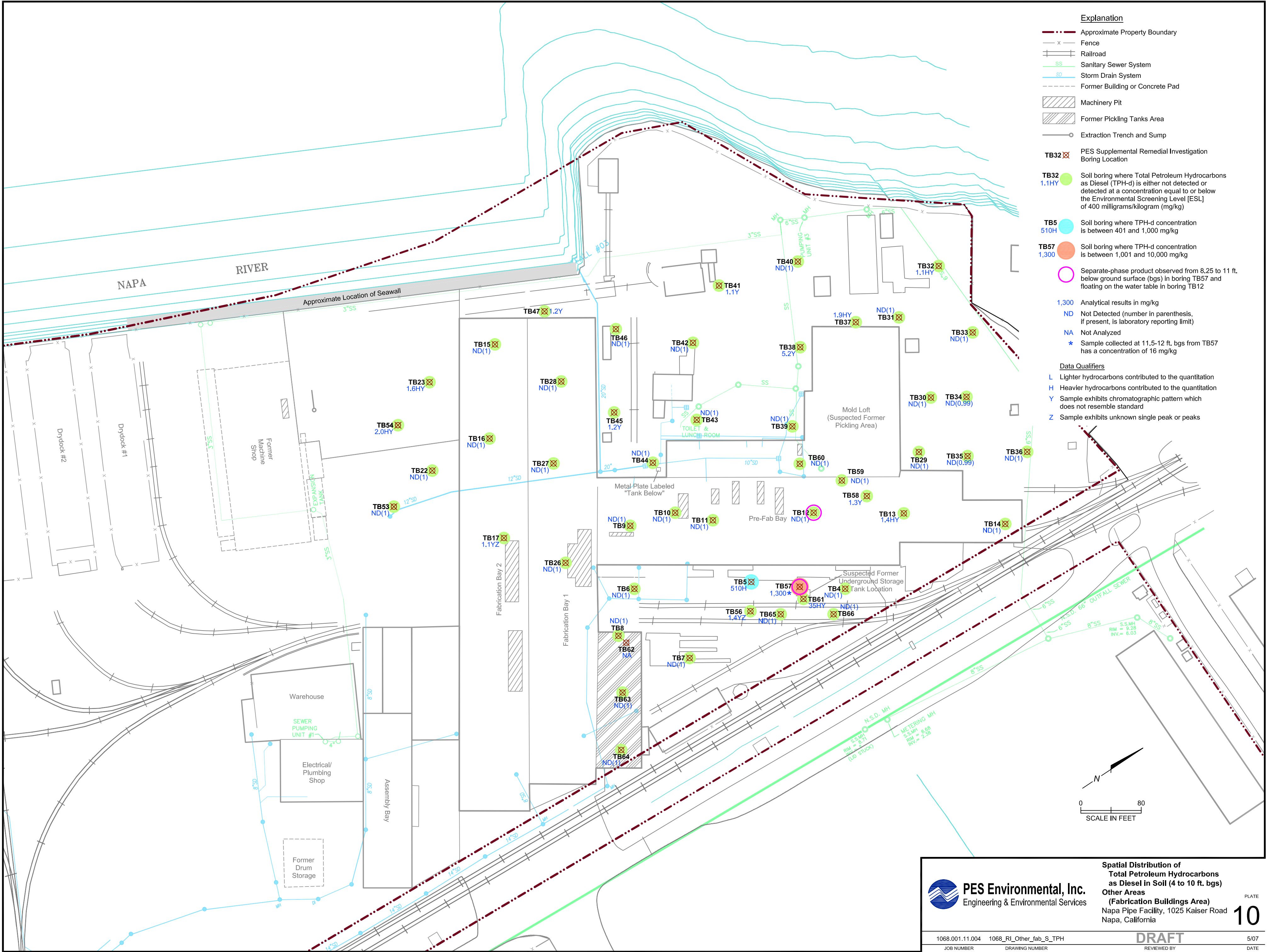




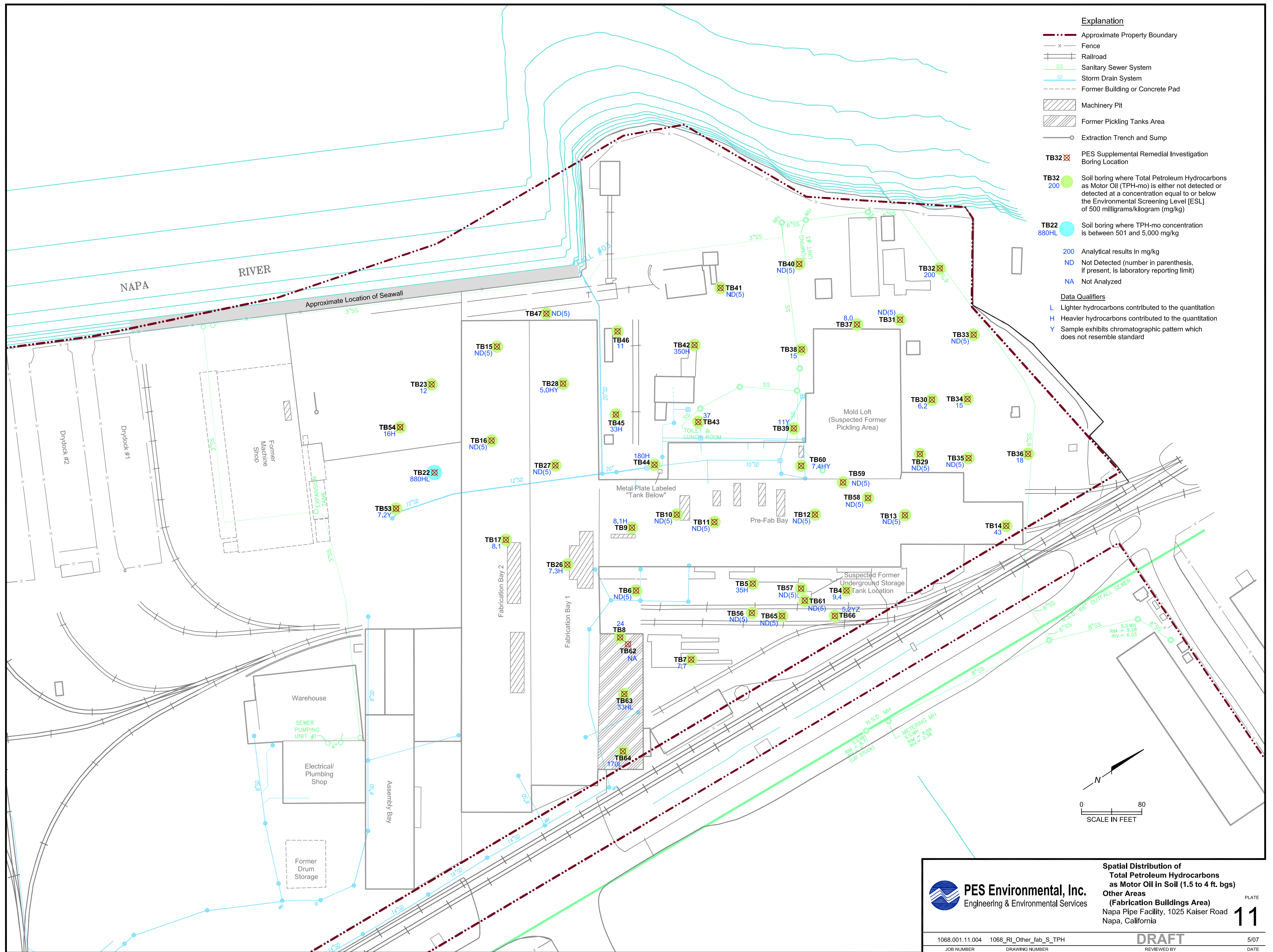




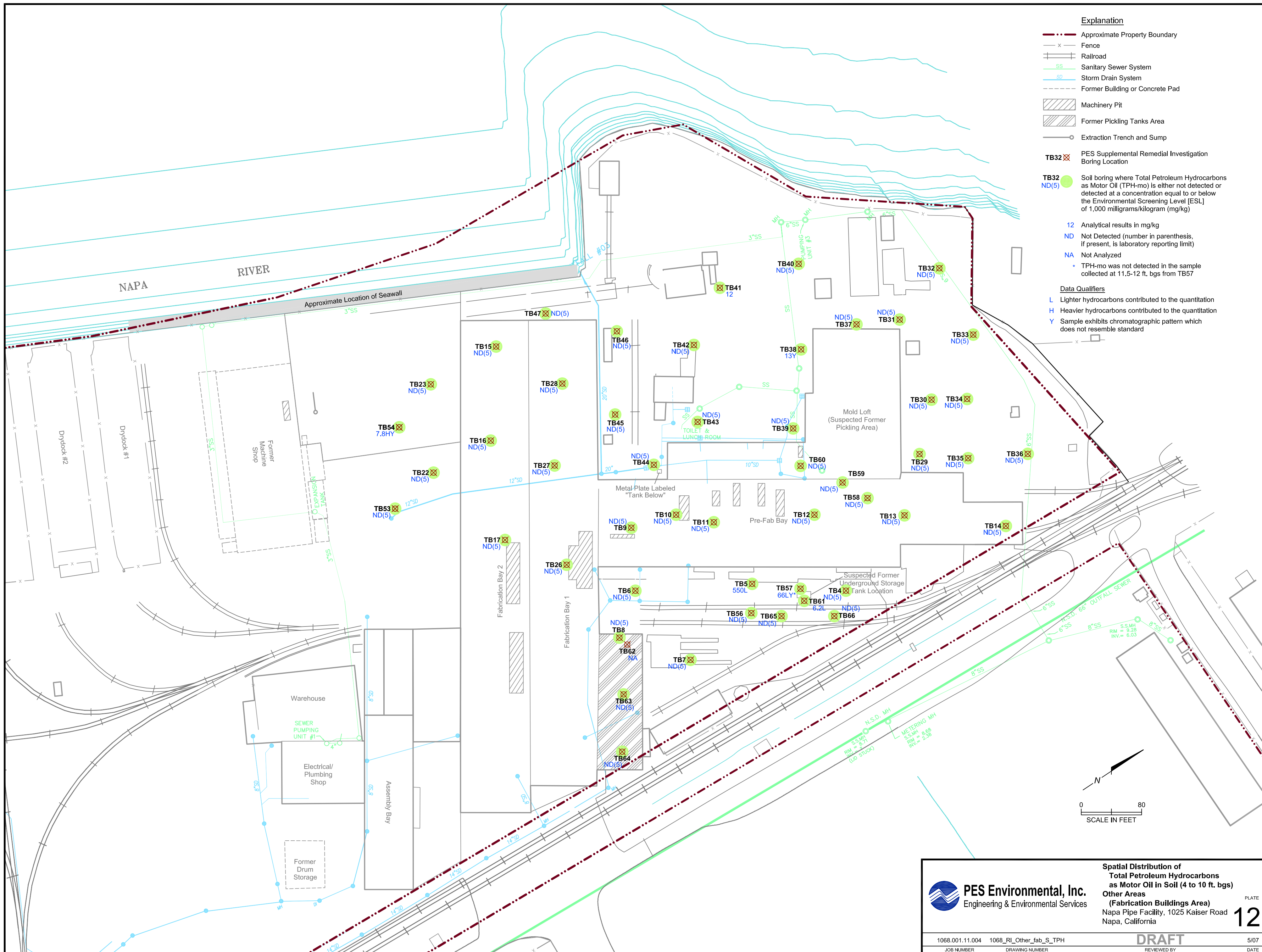




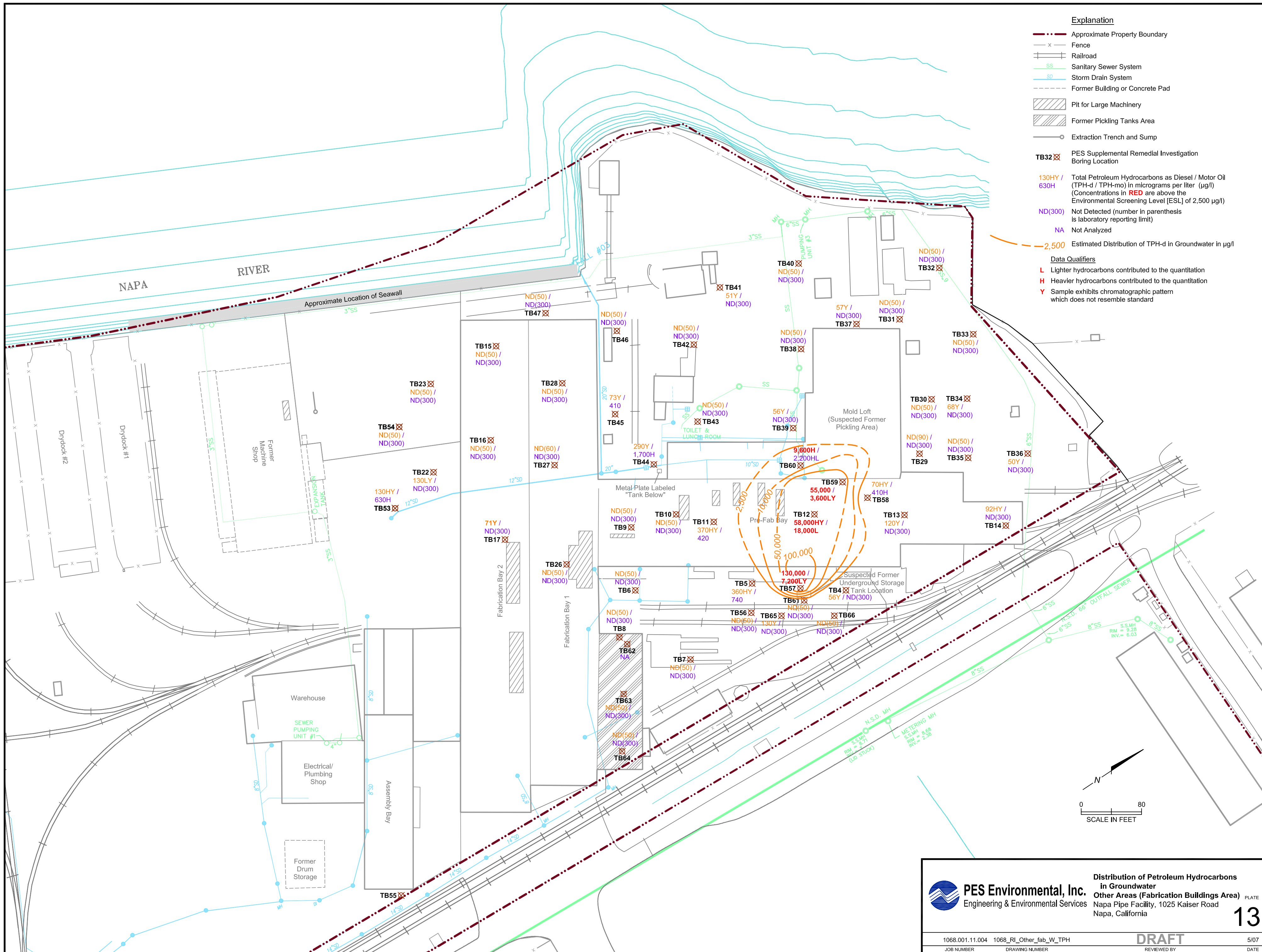




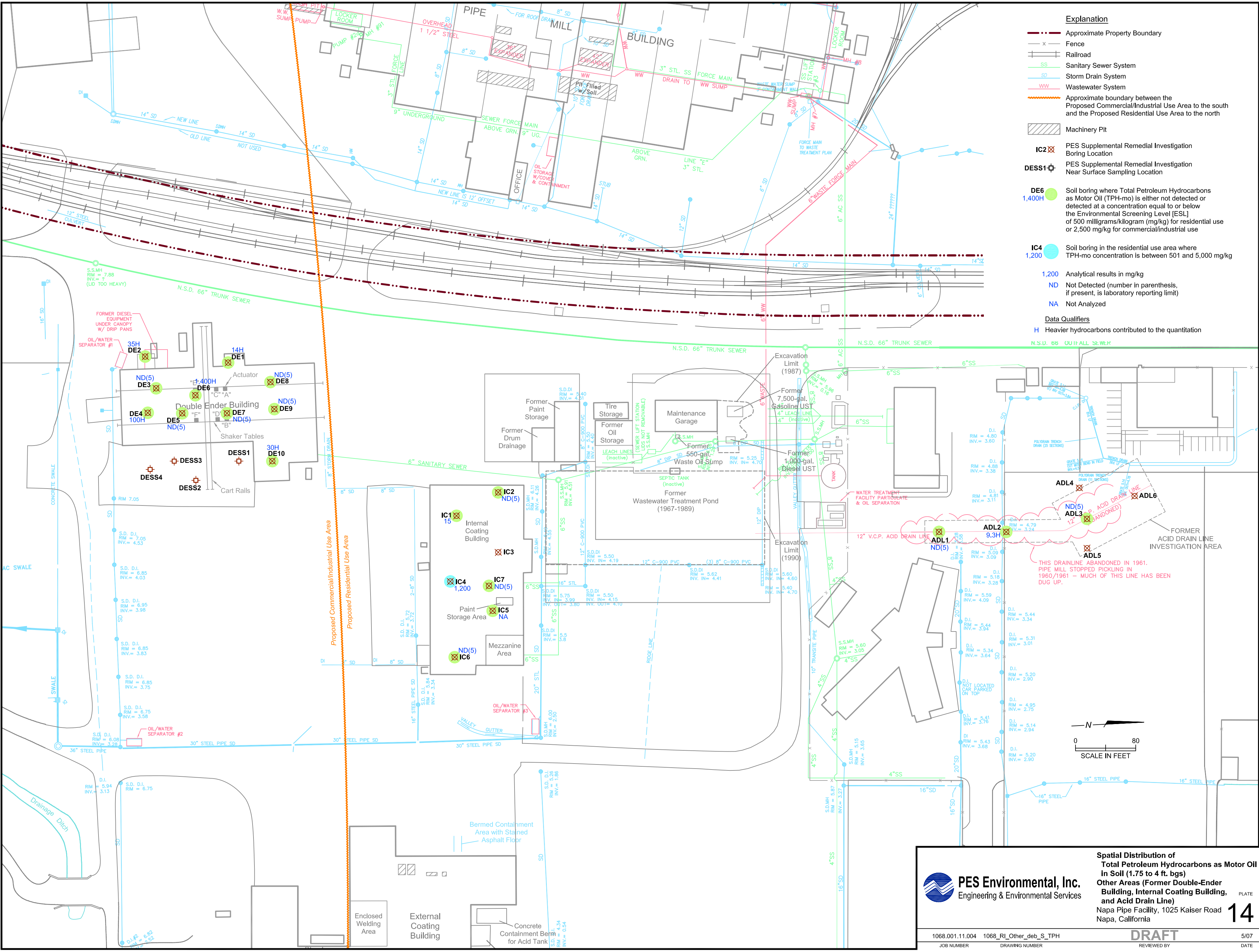















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**Spatial Distribution of  
Total Petroleum Hydrocarbons as Motor Oil  
in Soil (1.75 to 4 ft. bgs)**  
Other Areas (Former Double-End  
Building, Internal Coating Building,  
and Acid Drain Line)

Napa Pipe Facility, 1025 Kaiser Road  
Napa, California

DRAFT

1068.001.11.004 1068\_RI\_Other\_deb\_S\_TPH

JOB NUMBER DRAWING NUMBER

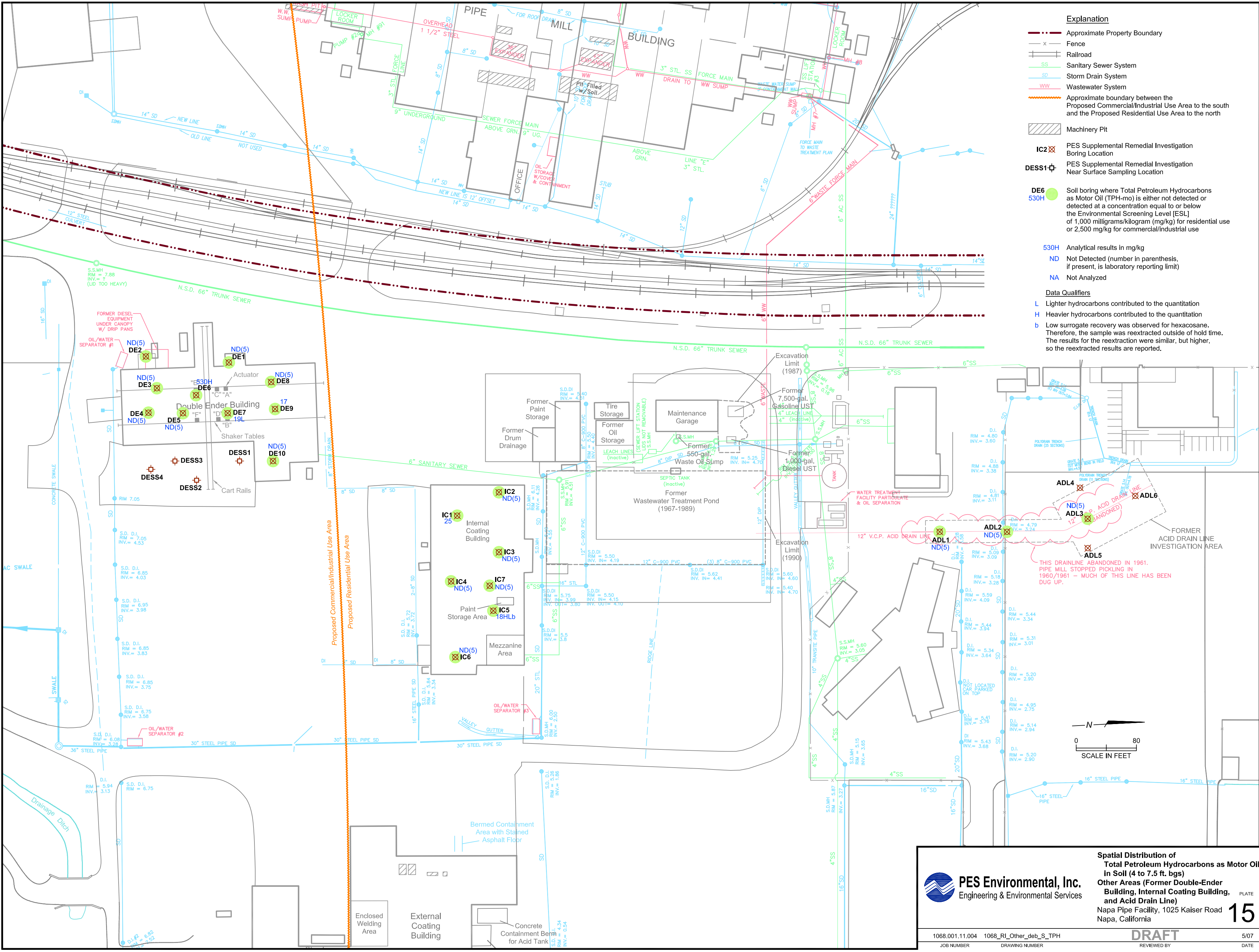
5/07

DATE

PLATE

14





Explanation

- Approximate Property Boundary
- Fence
- Railroad
- Sanitary Sewer System
- Storm Drain System
- Wastewater System
- Approximate boundary between the Proposed Commercial/Industrial Use Area to the south and the Proposed Residential Use Area to the north
- Machinery Pit
- IC2 PES Supplemental Remedial Investigation Boring Location
- DESS1 PES Supplemental Remedial Investigation Near Surface Sampling Location
- DE6 530H Soil boring where Total Petroleum Hydrocarbons as Motor Oil (TPH-mo) is either not detected or detected at a concentration equal to or below the Environmental Screening Level [ESL] of 1,000 milligrams/kilogram (mg/kg) for residential use or 2,500 mg/kg for commercial/industrial use
- 530H Analytical results in mg/kg
- ND Not Detected (number in parenthesis, if present, is laboratory reporting limit)
- NA Not Analyzed
- Data Qualifiers
  - L Lighter hydrocarbons contributed to the quantitation
  - H Heavier hydrocarbons contributed to the quantitation
  - b Low surrogate recovery was observed for hexacosane. Therefore, the sample was reextracted outside of hold time. The results for the reextraction were similar, but higher, so the reextracted results are reported.

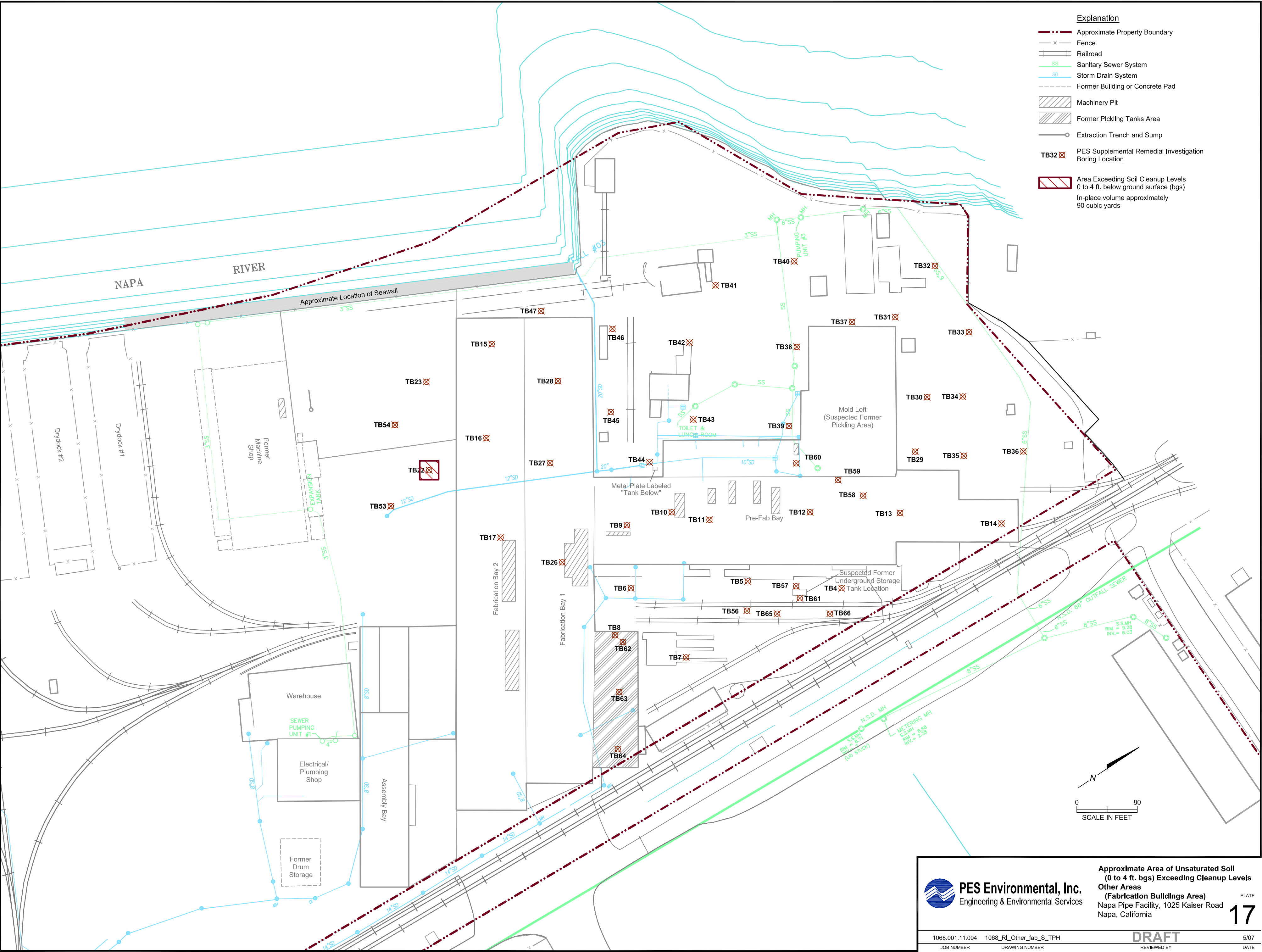


Spatial Distribution of Total Petroleum Hydrocarbons as Motor Oil in Soil (4 to 7.5 ft. bgs) Other Areas (Former Double-End Building, Internal Coating Building, and Acid Drain Line) Napa Pipe Facility, 1025 Kaiser Road Napa, California

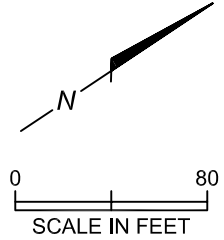




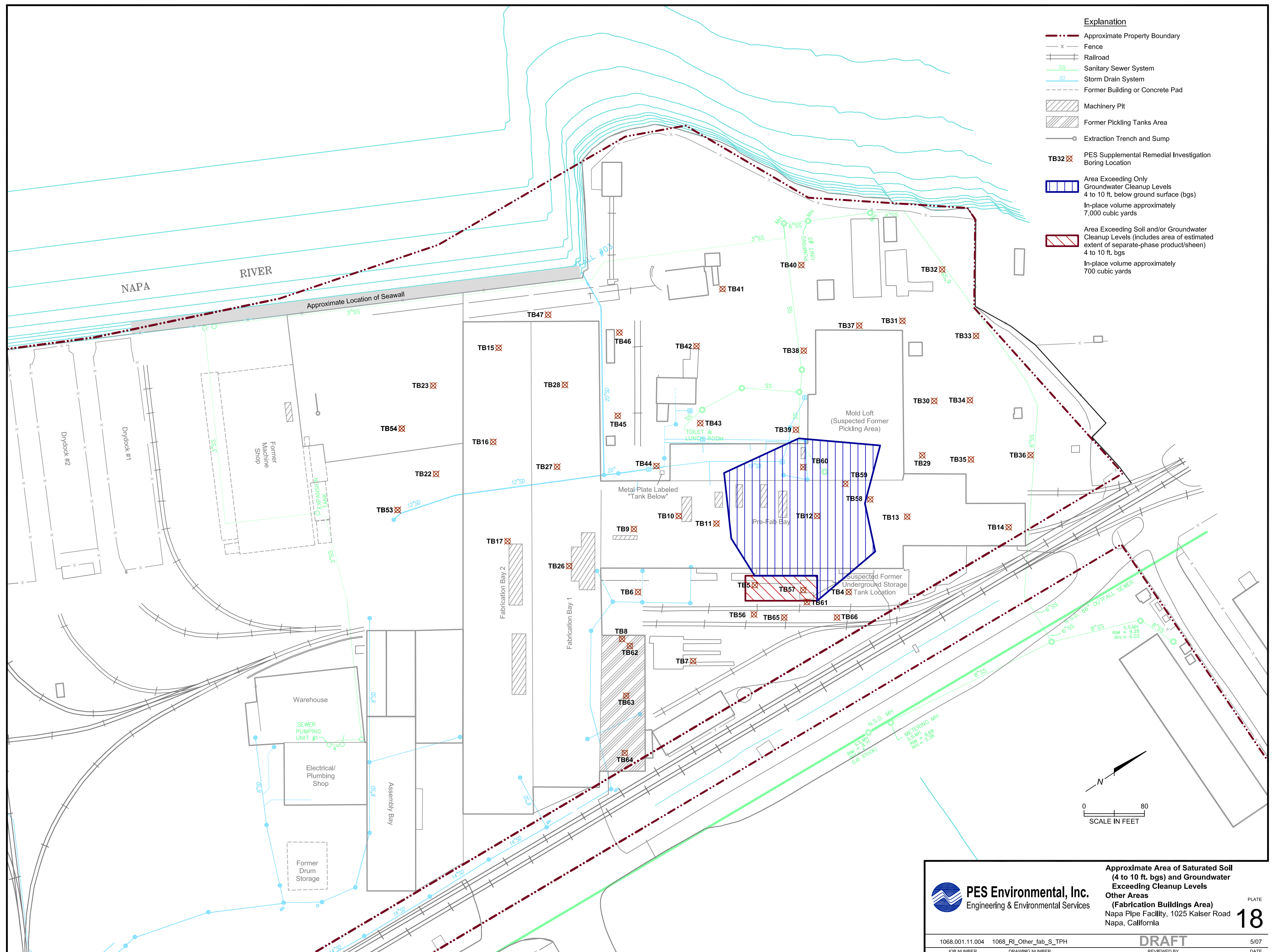




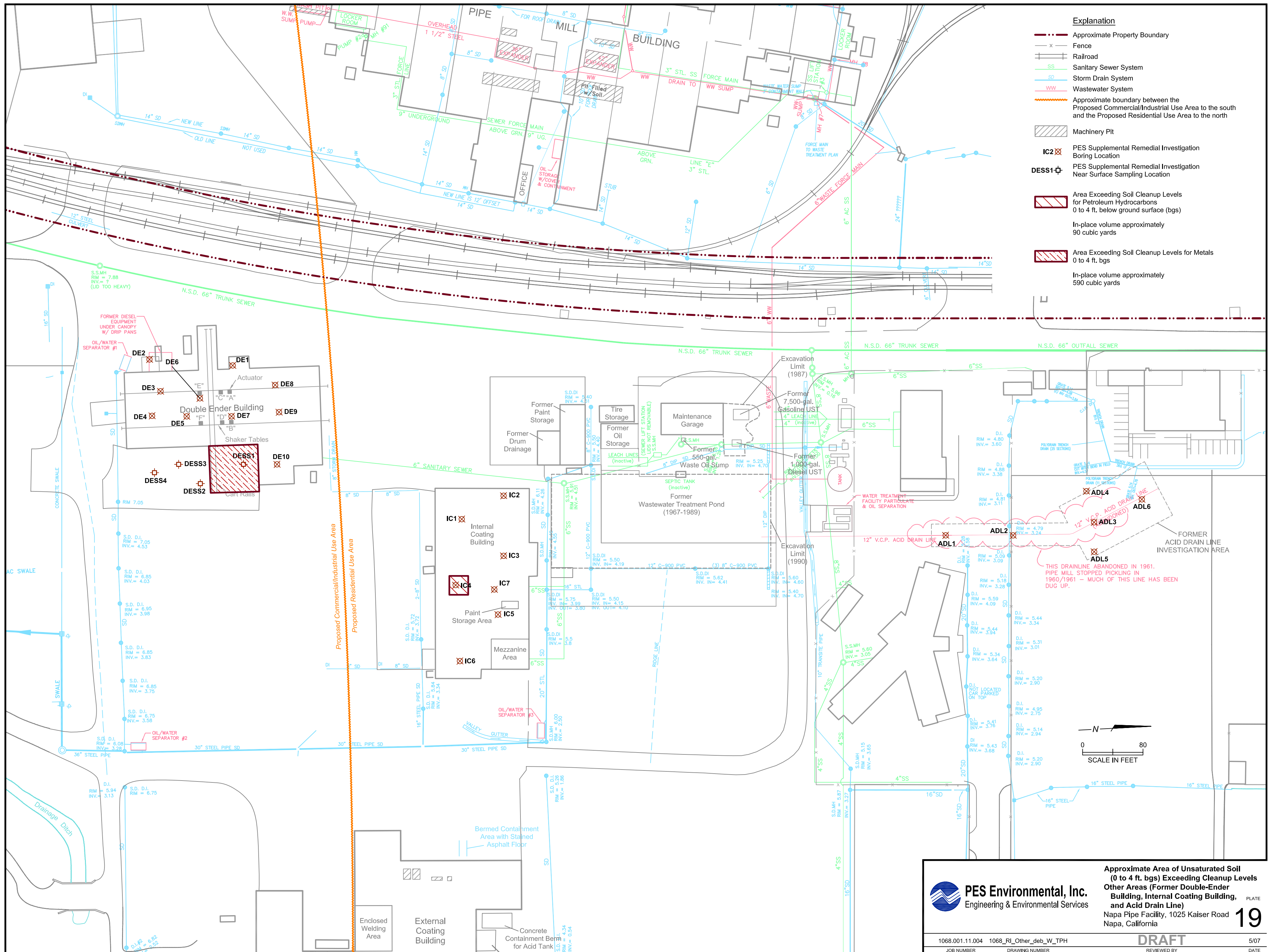
- Explanation**
- Approximate Property Boundary
  - Fence
  - Railroad
  - Sanitary Sewer System
  - Storm Drain System
  - Former Building or Concrete Pad
  - Machinery Pit
  - Former Pickling Tanks Area
  - Extraction Trench and Sump
  - TB32 PES Supplemental Remedial Investigation Boring Location
  - Area Exceeding Soil Cleanup Levels 0 to 4 ft. below ground surface (bgs)  
In-place volume approximately 90 cubic yards



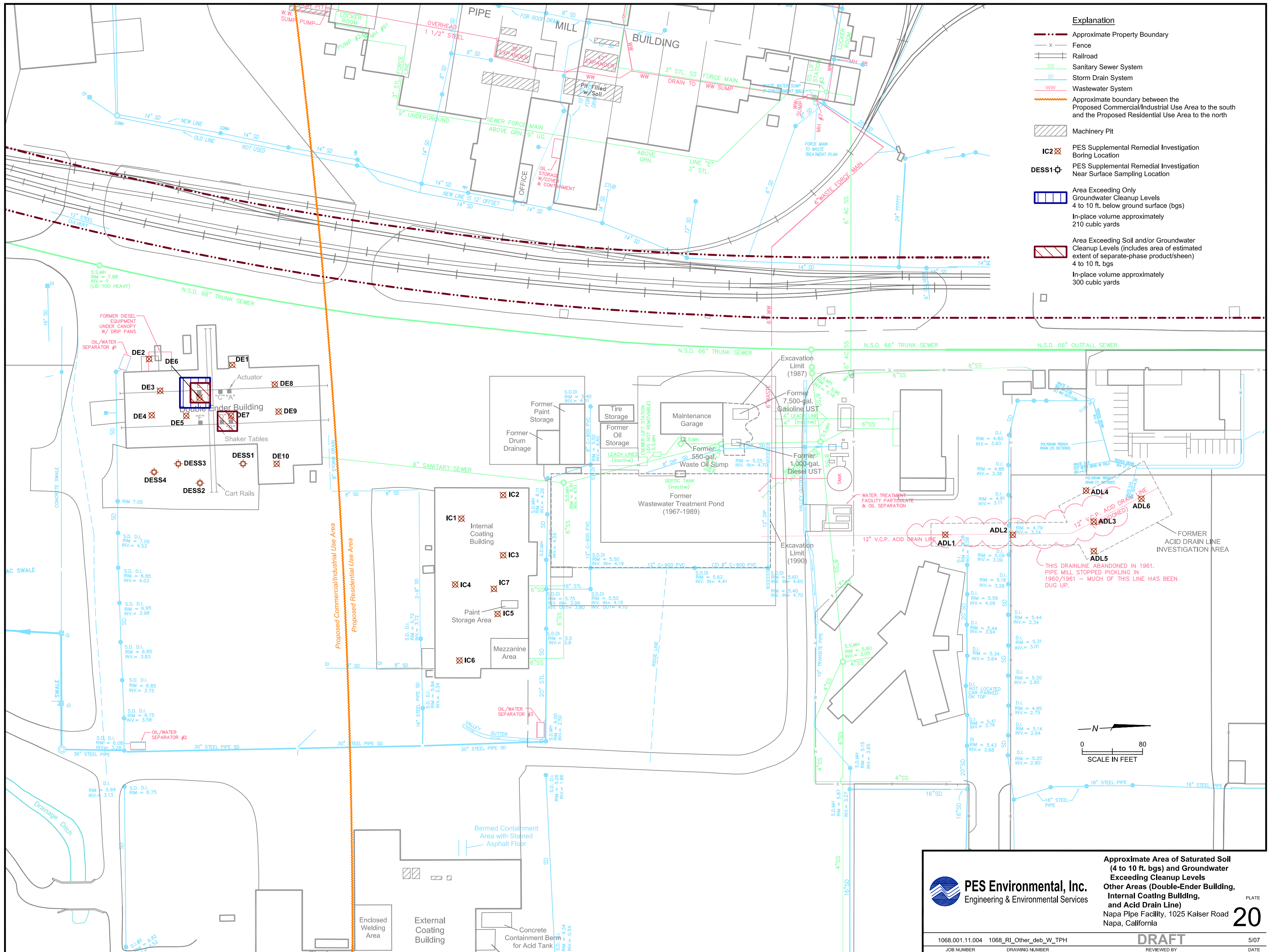
Approximate Area of Unsaturated Soil  
(0 to 4 ft. bgs) Exceeding Cleanup Levels  
Other Areas  
(Fabrication Buildings Area)  
Napa Pipe Facility, 1025 Kaiser Road  
Napa, California













**APPENDIX A**

**1965 SITE PLAN OF FABRICATION BUILDINGS AREA SHOWING LOCATION OF  
FORMER PICKLING TANKS**

## **APPENDIX B**

### **SUPPLEMENTAL REMEDIAL INVESTIGATION LITHOLOGIC LOGS**

**APPENDIX C**

**1983 GEOTECHNICAL LITHOLOGIC LOGS PREPARED BY J.H. KLEINFELDER &  
ASSOCIATES**

## **APPENDIX D**

### **TABLES AND PLATES ASSOCIATED WITH 1998 SOIL EXCAVATION AT THE FORMER DOUBLE-ENDER BUILDING**

## **APPENDIX E**

### **LABORATORY ANALYTICAL REPORTS AND CHAIN-OF-CUSTODY FORMS FOR SAMPLES SUBMITTED TO CURTIS & TOMPKINS, LTD**

**SUMMARY OF REMEDIAL INVESTIGATIONS,  
FEASIBILITY STUDY AND REMEDIAL ACTION PLAN  
NAPA PIPE FACILITY  
1025 KAISER ROAD  
NAPA, CALIFORNIA**

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**VOLUME 5  
OTHER AREAS – FABRICATION BUILDINGS AREA, DOUBLE-ENDER BUILDING,  
INTERNAL COATING BUILDING, AND FORMER ACID DRAIN LINE**

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**MAY 8, 2007**

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